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1957

PUBLICATIONS

OF

The American Philosophical Society

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THE ASCLEPIAD PHYSICIANS OF CNIDUS AND COS WITH A NOTE ON THE PROBABLE SITE OF THE TRIOPION TEMPLE OF APOLLO

WILDER PENFIELD

Director, Montreal Neurological Institute, McGill University

(*Read April 26, 1957*)

"If you had conceived of the idea of going to your namesake Hippocrates of Cos, of the house of the Asclepiads, and paying him a sum of money as a fee for your tuition what (would) you expect to become?"

This was a question that Socrates directed to a young Athenian. The young man's name was also Hippocrates. He answered that he would expect to become "a physician." Socrates then asked what he would expect to become, if he should pay a similar fee for tuition to the Athenian sculptor Phidias and the young man replied: "A sculptor."

Hippocrates was an Asclepiad who lived on the tiny Island of Cos, in the Aegean Sea, far to the south and east of Athens (fig. 1). This conversation, which was reported by Plato,[1] suggests that he was, in that time, the most distinguished physician in Greece including the Greek cities scattered all around the shores of the eastern Mediterranean. He was the leader in his field, like Phidias in the field of sculpture.

But, there, curiously enough, our personal knowledge of him ends. Who were the Asclepiads? This question has often been answered wrongly by medical historians. They assumed that the Asclepiads were priests in the temples and the shrines of the Greek god, Asclepius, the God of Medicine. This is not true. The Asclepiads, as pointed out by Withington,[2] were lay practitioners of medicine. They were first mentioned by Theopompus, as living in Caria in the city of Syrnus. Syrnus, according to Bean,[3] was on the southwestern coast of Asia Minor near the base of a long narrow peninsula. This was called, in old times, the Cnidian Peninsula, for the City of Cnidus was located there and Cnidus became still more famous as the teaching center of the Asclepiads.

The outer portion of the Cnidian Peninsula (fig. 2) was sometimes referred to as Triopion because, on it, was located the temple of the Triopion Apollo. But the exact location of the temple on the peninsula has long been a mystery. In spite of that it is well known that for many centuries the festival of Apollo was celebrated there each year, with games and contests by the six neighboring seaport cities. They were, in any case, near enough to reach the Triopion Temple easily in a day's sail, and by swift trireme in half that time.

Fig. 1. Map of the Aegean Sea in fifth century B.C. Athinai is Athens and Caria is Asia Minor. The cities of the Dorian Hexapolis shown by dots: Cos on the island of Cos, Cnidus on the peninsula of Cnidia, Halicarnassus, Camirus, Ialysus and Lindus. Probable site of Temple of Triopion Apollo is shown by dot in circle.

The six cities (fig. 1), all of them settled by Dorian Greeks, formed a league or Hexapolis: Cnidus and Halicarnassus on the mainland, Cos to the northwest on its island of the same name, and three cities on the larger island of Rhodes (Lindus, Camirus, and Ialysus) to the southeast.

[1] Plato, Protagoras 311 B.

[2] Withington, E. T., in *Studies in the history and method of science*, ed. Singer, Oxford, Clarendon Press, 1921.

[3] Personal communication from Professor George Bean, Department of Classics, Istanbul University. He stated that he had located the site of the city on the base of the Datca Peninsula near Marmaris.

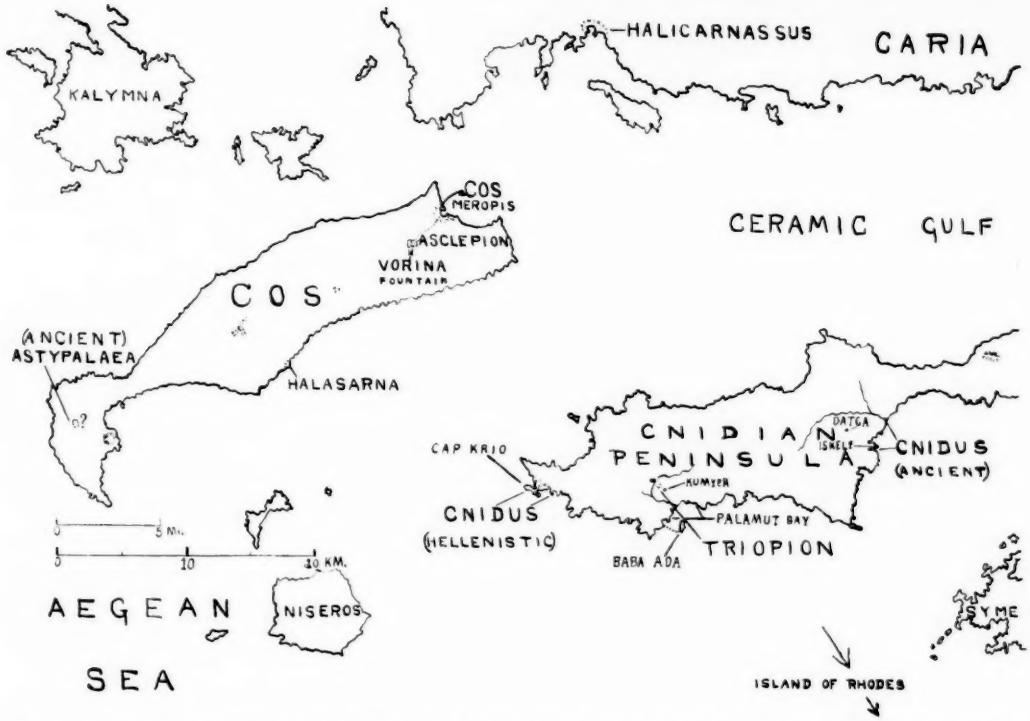

FIG. 2. The southeast corner of the Aegean Sea is shown here with the probable position of fifth-century Cnidus at Datca, Triopion at Kumyer, and Hellenistic Cnidus at Cap Krio or Tekir.

Occasional historical references are made to the Asclepiads of Cnidus toward the end of the fifth and the beginning of the fourth centuries before Christ. Euryphon seems to have been the leading physician of Cnidus. He was called, it is said, to Macedonia to the bedside of King Perdiccas, in consultation with Hippocrates. Ctesias, some years his junior, spent seventeen years in the Persian court as personal physician to Artaxerxes. Ctesias was also distinguished as an historian.

There developed a lively rivalry between the older center of medical teaching at Cnidus and the school of Hippocrates at Cos. The Corpus Hippocraticum, which was to serve medical men as a textbook for twenty-two centuries, is made up of medical lectures and talks. None of them is signed. But some may well have been written by the Cnidian, Euryphon, who evidently specialized in women's diseases. Some, on the other hand, are frankly critical of the teachings of the Cnidian physicians and it is safe to assume that they came from Cos. The probability that Hippocrates wrote the best of the books in the Corpus seems to me overwhelming,[4] but that is not intended to be the subject of this talk.

The Asclepiads claimed descent from Asclepius who lived as an ordinary man in the twelfth century before Christ. He was called the blameless physician of Thrace. He had two sons who served King Agamemnon, as physicians and fighting men, during the siege of Troy. It took more than three centuries of storytelling to convert Asclepius into a mythological hero, and finally a god.

Homer, writing in the ninth century, referred to him as a man, and his descendents, the Asclepiads, apparently continued to take that attitude. There is no reference to him in the Hippocratic writings except in the Oath. There the disciples

[4] Singer, C., *The legacy of Greece*, 201–248, Livingstone, Oxford Press. Jones, *Hippocrates*, Loeb Classical Library, 4 v., Harvard Press, 1908. Brock, A. J., *Greek medicine*, Library of Greek Thought, Dent, London, 1929. Edelstein, L., The genuine works of Hippocrates, *Bull. Hist. Med.* **7**: 236, 1939.

are called upon to swear by Apollo Physician and by Asclepius.

On the island of Cos there was a temple of Apollo in the sacred cyprus grove near the eastern end of the island, but no temple of Asclepius there in Hippocrates' lifetime. The famous Asclepion was built in the cyprus grove below the Vorina spring (fig. 2) in 350 B.C.,[5] after the death of Hippocrates.

This disposes of the statements made by Pliny, who wrote in the first century A.D. that Hippocrates had gained his knowledge of "that medicine which is called 'bedside medicine' " by copying the inscriptions from the Asclepion of Cos. Pliny went on to state that he had then burned the temple!

Another strange item of scandal was repeated in the biography written by Soranus in the second century after Christ. This physician of Ephesus seems to have used all the sources available to him five hundred years after the death of Hippocrates.

At that time the people of Cos were still celebrating the birthday of Hippocrates who, they stated, was descended from Hercules and Asclepius, the twentieth generation from the first and the nineteenth generation from the second. The account goes on to tell the second scandal which fits so little with the spirit of humanity that shines through the Hippocratic writings:

"He left his own country," Soranus wrote, "for the burning of the library of Cnidus, if we may believe a malicious writer, Andreas, in his book of the Origin of Physick."

This statement suggests at least that there may have been a library, a medical library, in Cnidus. Indeed it is the earliest reference to such a thing. It recalls, also, the ancient professional rivalry of the two schools.

Karl Sudhoff closed his monograph on "Kos und Knidos" in words that I may translate as follows:

The "sun of eternal medicine still shone on Cos and Cnidus" until well into the eighteenth century and "the palm of victory inclined now to the south and again to the north across the Ceramic Gulf, first toward Cnidus and again to Cos."[6]

Competition of independent city states during the sixth and fifth centuries B.C. provided a motive force of considerable importance. This was the classical period of greater Greece. As Kitto[7] has so well pointed out, the games at Olympia, and Delphi, and Athens and a score of other cities were much more than games. They were religious offerings to Zeus, Apollo, Athena, or other gods.

The contests took place in sacred precincts and the gods were thought to delight in excellent performance (*aretê*). Bodily superiority or mental superiority were of equal value. The contest (*agon*) of poet against poet, actor against actor and athlete against athlete led to great personal achievement. The anguish, the agony of the struggle revealed the man and doubtless spurred him to greater heights.

History is strangely silent in regard to the doings of the Doric Hexapolis, the "Doris" beyond the sea. Herodotus was born in Halicarnassus in 484 B.C., 24 years before Hippocrates, and his occasional descriptions help us. He described how it was that his native city was expelled from the league because one of its athletes had broken the law of the Triopion Temple. After that it became the Doric Pentapolis. But the record of the games, like the records of political and literary life in the Aegean, are lost for the most part.

This communication has to do with the cities of Cos and Cnidus as they were in the latter part of the fifth century when the Asclepiads had reached the peak of their achievement. And it has to do with the location of the temple of Triopion Apollo which played an important role in social and religious life. The confusion in regard to the position of Cos and Cnidus at this period in history may be explained as follows: At about this time the Persians had begun to make war by sea as well as by land. Consequently the island seaport cities had lost their immunity from attack.

Fear of Persia drove them to change their positions to sites more easily defensible. The three ancient cities on the island of Rhodes combined to build one new seaport at the present site of the city of Rhodes (the northeast tip of the island). The date of that founding is known, 408 B.C.

On the island of Cos the ancient capital was Astypalaea, situated somewhere on the western end of the island. In Hellenistic times the chief city came to be that on the eastern end. It was called Cos or Cos Meropis. This is where the present capital stands today (fig. 2). But when

[5] Edelstein, L. and E., *Asclepius, a collection and interpretation of the testimonies* **1** and **2**, Baltimore, Johns Hopkins Press, 1945.

[6] Sudhoff, K., *Kos und Knidos*, Münich, 1927.

[7] Kitto, H. D. F., *The Greeks*, Pelican Books, 1951.

it was that the transition occurred from west to east is a matter of present debate.

Twenty-four years ago (1933) an earthquake shook down the buildings of the present city of Cos. That was during the Italian occupation. Laurenzi, the Italian archaeologist, studied the ruins during the rebuilding and concluded that the city was considerably older than had been supposed.[8]

The earthquake dislodged a tablet of Pentelic marble from a wall where it had been hidden as a building stone. It bore an inscription that identifies it as an Athenian monetary decree, dated 449 B.C. It was a decree establishing the amount of payment due to Athens, in virtue of the fact that Cos was a member of the Delian League. The tablet was to be set up in the market place of "Kos."[9]

This is strong evidence in favor of the view that the capital had already moved to Cos Meropis as early as 449 B.C. when Hippocrates was a boy of eleven. However, this whole matter must be settled by further archaeological study and Astypalaea waits for the spade of the excavator.

Meanwhile, the people of Cos guard the mighty plane tree under which, ancient tradition confidently asserts, Hippocrates taught his disciples. The tree is in the city of Cos at the eastern end of the island, not far from the site where the Athenian tribute stone was found.

Cnidus, it now appears, was not always in its strong Hellenistic position at the tip of the peninsula (fig. 2), although it was here when the Apostle Paul passed it on his voyage to Rome (Acts 27: 7). Newton[10] excavated this city in 1863. He believed that the temple of Triopion Apollo was located on the tip of the peninsula within the city of Cnidus. But he failed to find any trace of the temple.

Bean and Cook,[11] in a recent study, have thrown new light on the problem. They quote the description of the long narrow peninsula given by Herodotus. He called it Cnidia, and said that a part of it (apparently the western portion) was called "Triopion." This description does not fit the conception of Newton. Bean and Cook point out that the peninsula is long and mountainous, sixty-three kilometers from the base to tip. It is so narrow at the base that, as Herodotus had pointed out, the Cnidians had once tried to convert the peninsula into an island by digging a canal through it where it was only five stadia across. This task was never completed.

Bean and Cook made a survey of the surface pottery and came to the conclusion that, at the site of Newton's Cnidus (now called Tekir or Cape Krio), there was nothing to be found that was older than the fourth century, nothing except some older coins and lamps.

On the other hand, in each of the two fertile areas they found a rich focus of sherds from the earlier classical period. The most easterly ancient site is at Datca (fig. 2) and this, they suggest, was the position of Cnidus, at least until late in the fourth century when the whole city must have been transferred to Tekir. There is, as they point out, a good harbor there and the remains of an ancient mole.

Midway between early eastern Cnidus and the tip of the peninsula is the second fertile area. Here at the village of Kumyer, two or three kilometers inland from Palamut Bay, they found a second area rich in old pottery fragments from the sixth and fifth centuries, as well as from later periods. This, they suggest, may be the place where the Triopion games were held and the site of the temple of Apollo.

The western half of the Cnidian Peninsula is shown in figure 2. The five or six thousand Turkish inhabitants who live there now are divided between the two fertile areas mentioned above. In the area called Datca, the local Governor or Kaymakam has his headquarters on a spit of land called the Iskele and south of this lies the harbor (fig. 3). There is a dock here where occasional small steamers land. This harbor may well have served the city of Cnidus very well, in classical times.

On the shore two kilometers northeast of Iskele is a promontory and about its base an ancient sea wall which extends around the promontory and onward another kilometer to the mouth of a small river. The promontory is called Dalacak (pronounced Dalajak). Pottery fragments on it and in the fields behind are plentiful. Certainly this is the site of an ancient city.

We were guests of the Kaymakam, Mr. Ziya Ekinçioglu, in his home which is built on a mound at the water's edge north of the Iskele. Shortly

[8] Personal communication.

[9] Merritt, B. D., H. T. Wade-Gery, and M. F. McGregor, *The Athenian tribute lists*, 2 v., Harvard Press, 1939. Also, Segre, M. Clara, *Rhodos IX*, 149, 1938.

[10] Newton, C. T. A., *A history of discoveries at Halicarnassus, Cnidus and Branchidae*, 2 v., London, 1862–1863.

[11] Bean, G. E., and J. M. Cook, *The Annual of British School at Athens* **47**: 171, 1952.

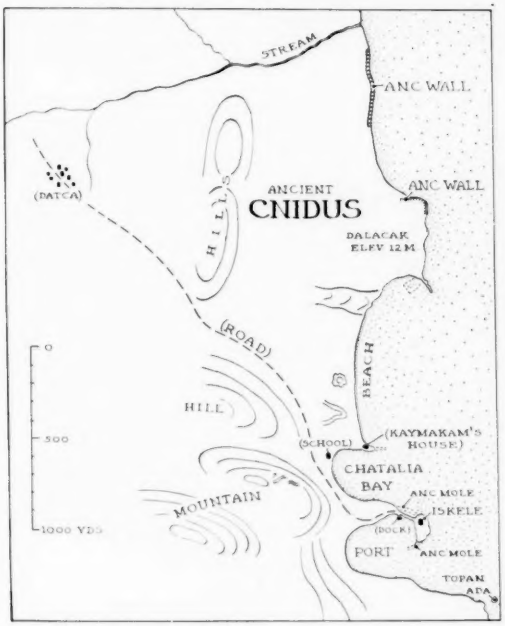

FIG. 3. Fifth-century Cnidus according to the surface pottery analysis of Bean and Cook.

FIG. 4. Pedestal, or pillar, found by the Kaymakam, Ziya Ekinçioglu. It is 70 centimeters high and 50 centimeters across the base.

after our departure he happened upon a large stone in his own garden about five meters from the house. Figure 4 shows the photograph which Mr. Ekinçioglu made of his find. It seems to be a pedestal, or a segment of a pillar, about which a serpent has been carved.

As a medical man I should like to believe that the serpent coiling about the pillar is significant. I should like to think it is the emblem of medicine. After all it comes from the ruins of Cnidus. Those more skilled in such matters may say that to give it medical significance is no more than wishful thinking.[12] I put the Kaymakam's photograph on record.

Let us now turn to the proposed site of Triopion. If I attempt to add evidence which favors the suggestions of Bean and Cook, I do so only as a physician who has studied this portion of the background of medical history, not as a trained archaeologist. Mrs. Penfield and I have made two journeys to Cos, Cnidus, and Triopion—the first in 1954 and the second in 1956 after reading the work of Bean and Cook in the *Annual* of the British School at Athens.

In Palamut Bay there is a sandy beach about two kilometers in length. A wooded valley slopes away upward to the tiny village of Kumyer, two or three kilometers distant. Just beyond the village there stands, in a commanding position, a twin-peaked hill, easily seen as one enters the bay by sea (see fig. 5).

On the top of this hill is the citadel or fortress described by Bean and Cook. Some of its con-

FIG. 5. Camara Bay and custodian's house on the beach. The hill with twin peaks is the proposed site of the Triopion Temple of Apollo. The village of Kumyer is hidden from sight on the level fields below the hill.

[12] Dr. J. M. Cook informs me that he remembers only one similar stone that was ornamented by a serpent and "that also was on the Cnidian Peninsula, about an hour from Tekir (New Cnidus)."

struction they consider to be from the classical period. When the visitor climbs to the top of the hill, he stands on a platform between the peaks. Below is a breathtaking view of the green valley, and Palamut Bay beyond, and the island of Baba Ada against the blue of the Aegean (see fig. 6).

The hill itself slopes down steeply to a remarkably level field below it and beyond the field is the village of Kumyer hidden in trees (fig. 7). The hillsides are strewn with many sherds and the fields also behind, and in front of, the hill. We, too, picked up "the sherds of archaic striped ware along with later pottery," as Bean and Cook described them. We walked along the ancient road that runs from Datca to the end of the peninsula. It is continuous except for the interruption of this settlement. There were large trees on either side of the old road. The local school teacher called them "haroup trees" and "Palamut trees." The Palamut tree is a species of large oak.

If it is true that the temple of the Triopian Apollo stood on this hill, and if the level fields below were used as the track for running races, then the east side of the hill might well have seated some thousands of spectators, like the towering sports stadium on the hillside at Pergamum.

But where could the ships of the six Doric seaport cities find harbor? Camara Becü (Bay) is open to the southeast and, although the shore has a gentle slope, no one could have beached a trireme or even a sailing skiff there during one of their furious southeast storms. Only the island, called Baba Ada, one thousand meters off shore, would have offered them protection.

There was a little wooden dock on the Camara

FIG. 6. View of Camara Bay and Baba Ada (Island) from the proposed Triopion Hill.

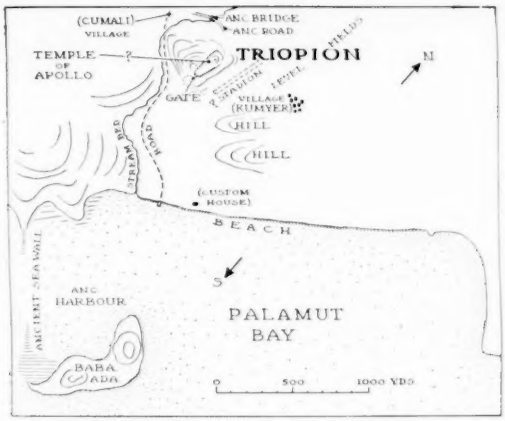

FIG. 7. Camara Bay and proposed site of the Triopion Temple of Apollo and the games of the Dorian Hexapolis. Horizontal lines show shallow water between Baba Ada (Island) and shore. The earth sea wall must have connected the two shallow areas. The position of the stadion is suggested.

beach, where our caique landed us on arrival, and a lonely building where the Custodian and Customs Officer lived with his wife. She served us coffee and I questioned the "officer."

"No," he said, "there is no sign of any building on the island out there, no harbor works, nothing."

I looked out at the island which was bare of vegetation and shaped like a sickle, running from north to south. The southerly tip of the sickle was away from us. It was low and curved back toward the shore. Even as I looked at it from the custom house, it was obvious that a sea wall, from tip to the shore, would provide perfect protection against any wind and, at the same time, afford a footpath to the shore.

On the other hand, if there was no harbor, how difficult to hold the festival there every year. I reviewed the evidence quickly. Perhaps Bean and Cook were wrong. I thought of Newton's claim that the temple of the Triopion Apollo had been on the towering cliff at Cap Krio, adjacent to that magnificent harbor at the end of the peninsula. To explain why he found no trace of the temple, he had suggested that it might have fallen off into the sea. But wherever the temple was, there must have been grounds for athletic contests as well, for the athletes were in the habit of dedicating their tripod prizes to Apollo, in his temple. Herodotus said that one victor, only, carried the tripod back to his house which was

in Halicarnassus. The result was that the city was expelled from the League![13]

We had walked over every foot of the city that Newton had excavated, the Hellenistic city of Cnidus. There were two theatres for drama. One must have seated five thousand people and the other three or four times that number. But there was no room there for stadium, gymnasium, palaestra—nothing like the historic settings of so many other festivals that we had studied at Olympia, Delphi, Priene, Pergammum. There wasn't even a level space for a stadium like that at Epidaurus.

The games of the Dorian Hexapolis seem to have been held annually for at least nine centuries. Surely there was a good harbor for those gatherings. They were held in the sixth century before Christ. As late as the second century after Christ, the hero, Agon from Cnidus, was reported as winning the pentathalon here.[14] In the third century Philadelphos honored the festival of Apollo and the Doric Pentapolis.

I turned back to the custodian and said to him: "There should be a wall from Baba Ada to the shore." When this was translated, his face lit up and he nodded.

"There is a wall," he said, "under water. My fishing line always catches on it there."

I had a sudden desire to hug this delightful Turkish official. But instead I asked more questions and he answered.

"When I am looking for fish," he said, "with my glass-bottomed box I have seen the wall often. It runs from the island to the shore. It begins at the far end of the island, where you see the low tip curving around. It runs straight to the shore at the second point of land south of the beach" (see fig. 7).

We hurried down to the caique that was waiting at the dock and sailed back and forth over the line of the wall, as he had indicated it. Even without the glass box and in spite of troublesome waves, I could see bottom clearly (at a depth of what I would judge to be between ten and thirty feet), for over a hundred yards out from shore and two hundred yards from the point of the Island straight inward. The British Admiralty map shows deep water, forty-eight fathoms, at a point just south of the position of the "wall" and fourteen and thirty-one fathoms to the north of it, between island and shore.

This much is clear: The under-water wall, as described by the custodian, and as partially verified by our inspection, was in the only position where it could have converted the sickle-shaped island of Baba Ada into a good harbor. Surely ships might have ridden at anchor there, whatever the wind and the storm. Unfortunately time did not permit us to remain longer, or to use the guardian's fishing tackle for a plumb line.

Herodotus referred to the whole Dorian promontory as Cnidia, as I have said, and the most westerly portion of Cnidia, including the site of the games, as Triopion.

When one considers the habits of Greek builders in the sixth century B.C., it is clear that the citadel behind the village of Kumyer might well be the site of the lost temple of the Triopion Apollo. The level plateau below it, to the east, would have served for the sports, and, possibly, the hill slope, facing east, might have served as a natural amphitheatre.

The word *Triopion* suggests something that slopes three ways. This hill has one flat slope to the east. It has a second slope to the southwest which falls away steeply far down into a valley and a stream bed. The present road from the Bay to Cumali and Kumyer passes up this valley to the south of the hill and, encircling it, approaches Kumyer from behind along the ancient highway. The hill might well have appeared to them three-sided, and so to have deserved the name Triopion.

In conclusion, it is clear that there are three habitable areas on the Cnidian Peninsula and that all three had good harbors. When the meagre historical references are considered, the claims of Bean and Cook seem reasonable, that the classical city of Cnidus was located at Datca (fig. 2), moving to the defensible position at Cap Krio sometime in the fourth century.

It seems reasonable also to conclude that the temple of the Triopion Apollo was in a separate site near the Bay of Camara and that it probably remained there without displacement, as the social

[13] Herodotus wrote (Herodotus, Loeb Classical Library. Translated by A. D. Godfrey) "the five cities, Lindus, Ialysus, Camyrus, Cos and Cnidus forbade the sixth city Halicarnassus to share in the use of the temple. Such was the penalty imposed on the Halicarnassians."

[14] H. Ruge, *Pauly-Real-Encyclopaedia der Classischen Altertumswissenschaften*, 174, Stuttgart, 1939. Spratt (*Archaeologia* **49**: 345, 1886) predicted that the place for the temple would be found elsewhere on the peninsula since there was no space for it in Newton's Cnidus. Historically there is a strange silence concerning these games. Nilsson (*Greich. Fest von Religioeser Bedeutung*, Leipzig, 1906) devotes 500 pages to Greek festivals and makes only one reference to the "Bundefest" of the Dorian Hexapolis.

and religious capital of the Doric Hexapolis or Pentapolis. The records, as well as the trophies, of the Doric Hexapolis may well be buried here. Opportunity beckons to the excavator at Kumyer, at what I believe to be Triopion, and at Datca where ancient Cnidus must have been located. Great reward also awaits the archaeologist at Astypalaea, on the island of Cos.

History is strangely silent in regard to the great cities of the Dorian Hexapolis. And the History of Medicine, in particular, has much to gain from future archaeology in this small corner of the Aegean Sea. It was the home of the Asclepiads and of the great Hippocrates. It was there, in the fifth century B.C., that Modern Medicine was born.

THE SMITHSONIAN INSTITUTION AND THE AMERICAN PHILOSOPHICAL SOCIETY

LEONARD CARMICHAEL

Secretary of the Smithsonian Institution

(Dinner Address, April 26, 1957)

THE American Philosophical Society, held at Philadelphia for promoting useful knowledge, and the Smithsonian Institution, held at Washington City, for the increase and diffusion of knowledge among men, have much in common. James Smithson, the lonesome, able aristocratic founder of the Smithsonian Institution, was a Fellow of the Royal Society of London and was actively interested in its work during his lifetime. As Dr. Conklin says in his *Brief History of the American Philosophical Society*, it is evident that Franklin had in mind an American society more or less like the Royal Society, chartered in 1662, when he founded the American Philosophical Society. I will try here to present some facts about the younger, sister organization in Washington, which grew out of James Smithson's novel idea. I will emphasize a number of relationships that have developed through the years between the Philosophical Society and the Smithsonian.

To many people the name "Smithsonian Institution" suggests what I regret to say some members of the popular press usually call the "Nation's Attic"; that is, a series of crowded exhibition buildings. This is not surprising, for the Institution has probably the world's largest catalogued collection of museum objects. It displays, protects, or stores for study more than 44,000,000 documented items.

From the first, however, those who have been charged with the management of the Smithsonian have thought of it not only as a great museum but also as a center for research, that is, for the increase of scientific, academic, and artistic knowledge. It was clearly James Smithson's plan that this should be the nature of his institution.

The Smithsonian was indeed probably the first organization on this continent to provide salaries for a staff of diversified scientific workers who could give their full time to research. One index of the productivity of these research men is found in the more than 7,500 specialized scholarly volumes and monographs that the Institution itself has published and distributed, largely without charge, to the learned world. Many times this number of detailed research papers have also been published in specialized periodicals by its staff during its more than a century of operation. The Institution has one of the huge science libraries of the globe. About a million Smithsonian titles are deposited at the Library of Congress, and half a million are in our own buildings.

A study of the history of the Smithsonian shows that, through the years, it has reflected in an interesting way the changing pattern of the American research world. Over and over again it has served as a guide and pacemaker in the relationship between the Federal Government and organized science.

Through the decades the Smithsonian has helped to establish a good many governmental and university laboratories and has assisted many individual scientists and college professors all over the country in starting modern scientific work. This nurturing of science still goes on at the Smithsonian. On any average day about two hundred visiting students in science, oriental art, and other academic fields can be counted as they do research in Smithsonian collections and laboratories.

James Smithson, whose enlightened idea first made this dynamic enterprise possible, was an Englishman who was at home in all the great cities of Europe. He was a descendant and friend of kings and nobles. Why then did he decide to found his institution in the young republic of the New World which he had never visited? Above all, why did he select what was still in the early nineteenth century the almost village-like Washington City on the Potomac as its site?

Possibly, but by no means surely, what we now call depth psychiatry might have explained some inner or unconscious basis for this action. But since he died long before the first analyst's couch was upholstered in Vienna, we now can only speculate about his hidden motives.

Some facts that are a matter of record about the

enigmatic founder of the Smithsonian may throw some light on his decision. He was born in France of English parents in 1765. He was the natural son of the rich and immensely influential Duke of Northumberland and of Elizabeth Macie, a very wealthy widowed gentlewoman who was herself a lineal descendant of King Henry VII of England. His mother had been twice widowed before James was born. She had inherited large fortunes from both of her previous husbands. Much of Smithson's estate came from his mother's large wealth, but some also came from a half brother, Colonel Henry Dickinson, a son of his mother by one of her husbands. A lesser but still substantial amount came to him from the Northumberland side from a half sister who was also a natural child of his father.

It is interesting that General Hugh Percy, second Duke of Northumberland, James Smithson's half brother, was a leader of the English in their retreat from Concord in 1775. He was made an English Lieutenant General while in America but like Smithson was known to have a basic admiration for republican institutions.

James Smithson entered Pembroke College, Oxford, in 1782 and soon became especially interested in science. He was said to have been the best chemist and mineralogist of his time at Oxford. He received his Master of Arts degree in 1786. The year after he graduated he was honored by election to fellowship in the Royal Society of London. Henry Cavendish, the discoverer of the properties of hydrogen, was one of those who proposed him for membership.

From 1791 to 1825, Smithson published twenty-seven scientific papers. These were mainly in chemistry and mineralogy. He was a pioneer in what we now call microchemistry. Smithsonite, an important ore of zinc, is named for him because of his work on the carbonates of this metal.

Smithson never married. He lived for a time in Berlin, Rome, Florence, and Geneva. Always in any city he associated with men of science. Sir Humphry Davy was one of his few close friends. His only recreation that we know of was gambling in European casinos. As a good mathematician he early convinced himself that he could never really win in the gilded palaces of chance. Therefore, his wagers were not large. They were placed merely for his own excitement and amusement. A gossiping French observer of the gay world wrote of him that he was a familiar figure at the fashionable gambling tables but that they only claimed a minor part of his time, which was mainly given to serious study and science.

In his will he left a life interest in his estate to his nephew, Henry James Hungerford. Then he added, if his nephew died without heirs, that he bequeathed the whole of his property to "the United States of America to found at Washington under the name of the Smithsonian Institution an establishment for the increase and diffusion of knowledge among men." This short sentence, as I have said, epitomizes Smithson's novel and unique and still never duplicated program for the use of his fortune after his death.

Smithson died in Genoa, Italy, in 1829. He was buried there in the Protestant cemetery. In 1904, largely at the urging of a distinguished Smithsonian Regent and Philosophical Society member, Alexander Graham Bell, his remains were brought, with full American national ceremony, from Italy and interred in a marble sarcophagus in a special chapel in the original building of his own institution in Washington.

When his nephew, mentioned in the will, died in the year 1835, the President of the United States was officially notified of the bequest. Long negotiations and legal proceedings were required on both sides of the Atlantic before the estate was settled. At length English gold sovereigns were brought to this country. They were melted down and made into American coin at the United States Mint in Philadelphia. The amount was in excess of a half million dollars, at that time considered to be an endowment of magnificent proportions. The total invested funds of the Smithsonian today are more than twenty-five times this original sum, and the Institution's collections and exhibits are estimated to have a value well in excess of one billion dollars.

Congress did not immediately set the gift to work, but at last in 1846, after eight years of debate, the Institution was created as a legal entity. It is a special type of foundation. It has been called a "ward" of the Federal Government. The President of the United States is, ex officio, its presiding officer. The "Members of the Institution" are the Cabinet. The actual operation of the Smithsonian, however, is entrusted to a Board of Regents, which is composed of the Vice President of the United States, the Chief Justice, three Senators, three Representatives, and six private citizens. The list of Regents of the Smithsonian during the last one hundred and eleven years is a roster of many of the great names in science and statesmanship of our nation, including such men

as Alexander Dallas Bache, George Bancroft, Jefferson Davis, Louis Agassiz, Rufus Choate, Asa Gray, Alexander Graham Bell, and Millard Fillmore.

One of the Regents, customarily the Chief Justice, is elected by the Board to serve as Chancellor. Our fellow Philosophical Society member, Chief Justice Warren, is the present distinguished Chancellor of the Smithsonian. It is interesting to note that down through the years many, possibly most, of the civilian Smithsonian Regents have also been members of the Philosophical Society. Of the present Regents the Chief Justice, Dr. Arthur H. Compton, Dr. Crawford H. Greenewalt, Dr. Caryl P. Haskins, and Dr. Jerome C. Hunsaker are all members of the Philosophical Society.

Inspired principally by the leadership of John Quincy Adams, always a forward-looking advocate of science and learning, Congress passed the law creating these boards and otherwise authorizing the Institution. This Act was signed by President James K. Polk on August 10, 1846. On this day it may be said that for the first time the Government of the United States formally recognized science as a function of government, and especially what we now call pure or basic science. It is true that before this time the Federal Government had participated in specific scientific activities, such as the Lewis and Clark Expedition and the United States Exploring Expedition under Charles Wilkes. But the main and publicly avowed purpose of all these earlier activities had been not pure research but the solution of immediate and concrete problems of importance to a growing nation.

During the First and Second World Wars, and especially in the last postwar decade, citizens have heard more and more about science and national defense and national welfare and of the Federal Government's undoubted responsibility for fostering research. Many current statements on science and the Government are foreshadowed, sometimes almost word for word, in the more than century-old debates that led to the establishment of the Smithsonian. That the unique organization of the Smithsonian is a good one for the administration of special aspects of Federal scientific activity is still attested over and over again. In a paper "Some Thoughts on Science in the Federal Government," our fellow Philosophical Society member, Dr. E. U. Condon, in the fall of 1951, while Director of the National Bureau of Standards, made the following statement:

> The most natural way for the Congress to deal with science in a unified way would be for the scientific agencies of Government to be gathered up into what would be in effect a single Department of Government. . . . I am inclined to favor the adaptation of the Smithsonian for this purpose over the creation of a new Department.

This plan of Dr. Condon's may be too ambitious a pattern for the Smithsonian today, but this proposal does indicate an understanding of the past stability of the Smithsonian as a guardian of some aspects of science as related to the Federal Government. The Smithsonian, because of its history, has a stable place in the association of pure as well as applied science and the other departments of the Government. John Quincy Adams once said of the Smithsonian:

> Of all the foundations or establishments for pious or charitable uses which ever signalized the spirit of the age or the comprehensive beneficence of the founder, none can be named more deserving of the approbation of mankind.

At a later time, in the Supreme Court, Mr. Justice Holmes summarized what I hope will always be the nation's attitude toward the Smithsonian. He said:

> Parallel to the case before us Congress long ago established the Smithsonian Institution, to question which would be to lay hands on the Ark of the Covenant.

But now we come to the initial, and still in many ways the greatest, link between the Philosophical Society and the Smithsonian. The first Secretary elected to head the Institution was Joseph Henry. Alexander Dallas Bache, Franklin's great-grandson and a President of the Philosophical Society, was most instrumental in this selection and in urging Henry to take the Secretaryship once it had been offered him. As I have said, Henry was already a member of the Philosophical Society when he was selected to organize the Smithsonian. The second Secretary, Spencer Fullerton Baird, was also a member of the Philosophical Society when he was elected as Smithsonian Secretary. This was true again of the Third Secretary, Samuel P. Langley; the fourth, Charles D. Walcott; the fifth, Charles G. Abbot; the sixth, Alexander Wetmore; and also of the seventh, the present writer. In this connection I must admit that I always feel a real surge of Smithsonian pride as I look at the fine portraits on the wall of the main stairway of our historic Philosophical Society Hall. In order

from the first floor up, are the portraits of Henry, Baird, and Langley—that is, of the first, second, and third Smithsonian secretaries. It may be said in parentheses that at the time of his election each Secretary of the Smithsonian Institution has been a member not only of the Philosophical Society, but also of the National Academy of Sciences, except Henry. This "prerequisite" could not have been applied to Henry as he was one of the founders of the National Academy of Sciences during his time as Secretary of the Smithsonian.

Henry, who has been called the greatest American experimental scientist between Franklin and the Civil War, had much to do, not only with the immediate success of the Smithsonian, but also with the programs that give it its present usefulness. He gave the skeleton of James Smithson's idea muscles, blood, and, above all, a good brain. Henry, for whom the international unit of induction in electricity was later named, was a world-famous physicist when he came to the Smithsonian. He was more than the Institution's first head; he was the architect of its present organization, and also in his extramural activities he was a guide and nurse to a large part of all scientific work in the America of his day. His fundamental discoveries in electricity were made in Albany and as professor of natural philosophy at what I recently heard Senator H. Alexander Smith, a present Congressional Regent of the Smithsonian, call that "hub of American learning," that is, the College of New Jersey, as Princeton University was then known.

Even after coming to his heavy administrative tasks in Washington, Henry continued important personal scientific research as each of his successors have also at least tried to do.

The Philosophical Society played a role in one of the great problems of Henry's life. He and Faraday both discovered self-induction in electricity at about the same time. But Henry's paper presented in 1835 before the Philosophical Society was not published, because of the leisurely attitudes of those days, until the issue of the Society's *Transactions* in 1837. This fact is often noted in considering Henry's historic place in this notable discovery. Many of Henry's other papers were published by the Society. One of these is his famous report on his experimental measurement of the temperature of sunspots, which may be taken as the start of the Smithsonian's now world-famous work in solar and general astrophysics.

In determining the directions which the new Smithsonian should take, the Regents wisely left to Henry the interpretation of what James Smithson had really meant by his dynamic phrase "for the increase and diffusion of knowledge among men." He made a great success of his work in Washington, and little by little the Federal Government began to turn to the Smithsonian to administer other scientific matters. Henry thus came to be required, as have his successors, to justify appropriations to the Smithsonian before the Congress. The record shows that Henry performed this important duty with great skill.

In spite of his regard for pure science, Henry was always a practical man. Franklin would have approved of him. For example, in the meteorological studies he inaugurated at the Smithsonian, he combined pure and applied research. In his second annual report (for the year 1848) he outlined a plan to use the electric telegraph, which he had done so much to develop, to obtain weather reports from a vast network of voluntary observers scattered over the country. In this work he collaborated with Elias Loomis and James P. Espy, who were also members of the Philosophical Society. Henry's weather project was a huge success, and by 1858 weather maps, the first ever compiled from telegraphic reports, were made and displayed each day in the Smithsonian building. At Henry's urging, Congress later established the Weather Bureau of the United States Signal Service, and the Smithsonian's system was turned over to it.

During the Civil War, Henry was a member of a large number of commissions set up to examine and report upon various experiments intended to help in the Federal war effort. He did this loyally, although he was known, like so many resident Washingtonians, to have some sympathy with the South. Some of these war investigations were conducted at the Smithsonian Institution. It is reported, for example, that from the top of our great tower, night after night, mysterious lights were flashed to distant stations, in connection with tests of new methods of military signaling. Henry's companion in these studies was not infrequently President Lincoln, who is said to have been glad to leave the pressures of the White House and walk across the city, often alone, to seek rest and possibly even inspiration by working with his close friend Joseph Henry, who in those days lived with his family in the old Smithsonian building.

This scientific war work of the Smithsonian was important in leading up to the establishment of the National Academy of Sciences in 1863, by

Act of Congress. Henry also had participated in the earlier formation of the American Association for the Advancement of Science.

Henry had a part in what was probably the beginning of military aircraft in America, and thus began the continuing interest of the Smithsonian in research in aviation. Thaddeus S. C. Lowe, a pioneer aeronaut and chief of the aeronautical corps during the Civil War, had undertaken to test the practicability of balloons for military purposes. Henry encouraged Lowe in his tests, helped him gain an audience with President Lincoln, and on June 13, 1861, permitted Lowe to send up his balloons from the grounds of the Smithsonian or the "Smithsonian Park," as much of The Mall was, we still think, very properly called. It may be noted here that the world's greatest research organization in aviation, the National Advisory Committee for Aeronautics, was founded more than forty years ago at the Smithsonian and still has associations with the Institution. The Smithsonian also first supported Robert H. Goddard's rocket research, which for better or worse is fundamental in today's intercontinental missiles.

Henry died while still in active office on May 13, 1878, in his eighty-second year. Just before his death his friends made him a gift of the then not inconsiderable sum of $40,000 so that he could feel that his family would be well provided for. Henry is buried in Oak Hill Cemetery in the Georgetown section of Washington. President Hayes, the members of the Cabinet, the Justices of the Supreme Court, and members of the diplomatic corps and of numerous learned societies went to the grave with his body. A memorial service was held in the House of Representatives on January 16, 1879. By concurrent resolution members of the Senate and House of Representatives attended this service as well as the President, Cabinet Members, and Justices of the Supreme Court.

Joseph Henry's chief assistant at the Smithsonian, who later succeeded him as Secretary, was Spencer Fullerton Baird, who had already been active in Philosophical Society affairs. He took charge principally of the Institution's publication program and of the still useful International Exchange Service, by means of which research publications of America and the world are interchanged. Baird was one of the country's leading biologists and an outstanding example of the able young scientists that Secretary Henry gathered around him in the early days of the Smithsonian.

Baird as Secretary made his greatest contribution in building up what is still the Smithsonian's largest branch, the United States National Museum, of which our fellow Philosophical Society member, Remington Kellogg, is the present distinguished head. In the process of accumulating its vast collections in biology, geology, and anthropology, this museum has become, in some respects, unequaled in the world. Much that is unique in these collections has resulted from the explorations of the Institution. This work of directing field trips continues as one of the Smithsonian's important functions down to the present day. Last year the Institution participated in more than twenty expeditions, most of which were paid for by special gifts. Years ago Baird's testimony about a Smithsonian expedition to Alaska is said to have decided Congress to purchase this great area from Russia. He reported that this territory had furs, fish, timber, copper, and gold.

The later great Conservation Movement of our fellow Philosophical Society member, Theodore Roosevelt, and of Pennsylvania's Gifford Pinchot also owed much to field studies of the Smithsonian.

The man who helped most to organize the study of the American Indian at the Smithsonian was Major John Wesley Powell, also an active member of the Philosophical Society. He is best known to most of us as the intrepid one-armed explorer who first went down the mighty Colorado River through its canyon. These explorations, which were accomplished with the Smithsonian's help, led directly to the establishment of three Government agencies, the Geological Survey, the Reclamation Service in the Department of the Interior, and the Bureau of American Ethnology in the Smithsonian Institution.

The Bureau of Ethnology of the Smithsonian (the word "American" was added later) was founded in 1879 through Powell's influence. He was its first director. Immediately he mapped out a far-reaching program which was to guide anthropological research in America for many years. With a small but amazingly hard-working staff he set to work. A comprehensive study of the Indian languages was inaugurated; a huge bibliography was compiled; and work begun on the great *Handbook of American Indians*, which was finally published by the Smithsonian from 1907 to 1910. The Bureau of American Ethnology of the Smithsonian has given social scientists

and historians for their use a knowledge of American prehistory, a first-hand record of a great living, but, even one hundred years ago, a rapidly vanishing, Stone Age people.

There has never been a full-length biography and evaluation of the work of Samuel Pierpont Langley, the third Smithsonian Secretary and Vice-President of the Philosophical Society, but he deserves such a book. Langley made great contributions in two fields, astrophysics and aeronautics. He founded the Smithsonian's Astrophysical Observatory, which is today, even more than ever before, one of the nation's leading centers for astronomical research. He invented the bolometer, an instrument that opened a new era in the study of solar radiation. He first mapped the solar spectrum in a modern way. His sensational early experiments in aeronautics are well known. Langley Field and the first aircraft carrier were both named in his honor.

Langley's immediate successor as Secretary in 1906, was Charles Doolittle Walcott, who once served as President of the Philosophical Society. He was one of America's greatest geologists. As Director of the United States Geological Survey, he served that agency with distinction, and he himself made important researches in Cambrian paleontology. After he was made Smithsonian Secretary, he built up the Institution's research funds and directed the construction with a Federal appropriation of the monumental Natural History Building on Constitution Avenue with its many now desperately overcrowded acres of floor space for exhibition and research work.

Dr. Charles G. Abbot, once a Councillor of the Philosophical Society, the fifth Secretary of the Smithsonian, made notable contributions to astrophysics, and, although he is now eighty-five, he still actively continues research on the sun and the weather.

Dr. Alexander Wetmore, one of the world's greatest ornithologists, succeeded Dr. Abbot and preceded me as Secretary of the Smithsonian. Dr. Wetmore did much for the Institution and steered it through the troubled days of the Second World War. During this period the Smithsonian was active in much war-related research in natural science and social anthropology.

Because of James Smithson's amazingly farsighted idea, his institution is now located, not in a quiet southern city, but what may well be the main nerve center of the civilized globe. There is lasting symbolism concerning statesmanship and science in the story of President Lincoln's holding apparatus for Secretary Henry's experiments. Surely in this atomic decade science and government and science and society are more than ever inextricably interwoven. That this interrelationship is not a new phenomenon and that the Smithsonian has had a formal as well as an informal part in the growth of this association are attested by the record. Today, of course, there are many other agencies of government concerned in scientific research, but all over the world the areas of investigation of the Smithsonian are well known and well defined in such fields as astronomy, zoology, botany, geology, and anthropology. These are known as the Institution's specialties and are not in the same way duplicated elsewhere. Each year private foundations and other agencies of government transfer considerable funds to the Smithsonian for specific scientific work in these fields. For example, under a grant from the National Science Foundation, the Institution is now organizing a belt of small astronomical observatories around the globe to photograph and measure with detailed precision the movement of the first artificial satellite that will soon be launched. The Smithsonian also by funds provided by other organizations maintains the Bio-Sciences Information Exchange which keeps track of all current research projects in biology and related medical fields.

The role of the Smithsonian, not only in research but also as an interpreter of science has long been recognized. In the *Education of Henry Adams,* the historian says much of Langley, third Secretary of the Smithsonian. At one point Adams remarks:

> Langley seemed to be worried by the same trouble, for he constantly repeated that the new forces (of uranium and radium) were anarchical, and specially that he was not responsible for the new rays, that were little short of parricidal in their wicked spirit towards science. His own rays, with which he had doubled the solar spectrum, were altogether harmless and beneficent; but radium denied its God—or, what was to Langley the same thing, denied the truths of his science. The force (radioactivity) was wholly new.

It may be remembered that this was almost sixty years ago. May the present Smithsonian staff be as farsighted!

Much that I have said so far relates to science and research, but from the first the Smithsonian has also been concerned with art. In this breadth of interest both the Philosophical Society and the Smithsonian differ from their parent, the Royal

Society of London, which has always limited itself to the observational and experimental sciences. In fact in the fundamental act of organization in 1846, the Congress of the United States directed the Smithsonian to form a gallery of art for the nation.

Today the Smithsonian has these three art bureaus: the National Collection of Fine Arts, the Freer Gallery of Art, and the National Gallery of Art.

Certainly one of the greatest gifts of art of all time was Andrew W. Mellon's presentation to the American people through the Smithsonian of his great collection of paintings and of the magnificent building, the National Gallery of Art. It was at Mr. Mellon's own insistence, because of his respect for the Smithsonian, that the National Gallery of Art was established by Congress as a bureau of the Institution.

The National Collection of Fine Arts of the Smithsonian at present has no building of its own, but it does have notable collections of paintings, sculpture, ceramics, glass, silver, and historic jewelry. The Smithsonian Traveling Exhibition Service is part of this bureau. At the present time this service has sixty-five traveling art exhibitions, many from abroad, which move from museum to museum in the United States.

Mr. Charles Lang Freer established at the Smithsonian the Freer Gallery of Art. The building which he gave was opened in 1923. The income from Mr. Freer's generous capital bequest, which incidentally has grown amazingly under Smithsonian administration, is used exclusively for the purchase of outstanding new objects for the collection and for the maintenance of the scholarly research activities and publications of the gallery. In this gallery are shown Mr. Freer's paintings by Whistler, Thayer, Dewing, and other American artists. Its most notable and world famous collections, however, are in Far Eastern and Middle Eastern art.

So in one hundred and eleven years James Smithson's idea has grown in art as well as in science. Today his original endowed institution continues its basic work. It now also administers ten government bureaus that have been assigned to it by the Congress in the intervening years. In recapitulation, these are the United States National Museum, with its many scientific research departments, the National Gallery of Art, the National Collection of Fine Arts, the Freer Gallery of Art, the Bureau of American Ethnology, the International Exchange Service, the National Zoological Park with its large collection of animals, the Astrophysical Observatory, the National Air Museum with the first Wright plane and many other famous aircraft, and the Canal Zone Biological Area, the only general biological research center in the tropics under the American flag.

Congress in recent years has appropriated funds to allow the Smithsonian to start essential work in rehabilitating its buildings and in the renovation of many of its old exhibits. Also, and most importantly, by a special large appropriation last year, the Congress has made possible the almost desperately needed erection of an additional Smithsonian building. This great structure will be a museum of History and Technology and will be located on the Mall side of Constitution Avenue between 12th and 14th Streets. In some respects this new structure, when it is opened after 1960, will be the greatest museum building in the world.

This necessary revivification of the physical plant of the Smithsonian has long been delayed. Fifty years ago the then new buildings, museum equipment, and displays of the Smithsonian were modern and world famous. But with passing years and the financial problems of wars and depressions, this unique showcase of the American people gradually fell deeper and deeper into disrepair. It thus came about that the world's greatest museum collection of scientific and other irreplaceable objects came to be displayed in a manner that was almost laughingly behind the times. Thus as recently as at the end of the Second World War the Smithsonian consisted of badly run-down buildings and out-of-date displays that were typical of the gaslight museum era. At just this time many other great nations of the world were improving displays and the exhibition of their national collections. Immediately after the Second World War not a few nations also began to erect great new museum buildings. The recent building program and reconstruction of the tremendous and outstanding Deutsches Museum in Munich is but one example of this truly global movement.

Owing to the wisdom of Congress, America's delay in this matter is now being splendidly changed. Soon all of the almost ten million visitors who come to the various Smithsonian buildings each year will be instructed and, we dare to think, inspired by the scientifically constructed modern teaching exhibits that they will see. Already as part of this reconstruction program, new Smithsonian halls have been opened,

which are attractive and which teach important and basic lessons about America's natural resources and about America's scientific technological, military, artistic, and social history. Among the important new halls which now instruct tens of thousands of visitors each month are those representing pre-Columbian archaeology, Indian tribes of America, birds of the world, North American mammals, dresses of the First Ladies of the White House, life in early America, and power machinery.

It is by effective museum displays and by its scholarly publications and its extensive information service that the Smithsonian today carries on James Smithson's idea of the "diffusion of knowledge." By its active and vital research programs and its many field expeditions, the Institution simultaneously promotes the other part of Smithson's basic plan; that is, the "increase of knowledge."

Certainly, we in this Society know that the need for the increase and diffusion of humanizing and civilizing knowledge is probably more important in the world today than it was in the calm year of 1829 when Smithson's strange, novel idea first became known. Because Smithson's idea was so charged with energy, the institution that embodies it has grown in strength with the passing years. In this growth the partnership of the Smithsonian and the Philosophical Society has been important for one hundred and eleven years. May this ancient association continue to strengthen both institutions in their work for the increase and the diffusion of knowledge among men in the ever more active thermoneuclear years that stretch ahead.

THE CHARLES S. PEIRCE–SIMON NEWCOMB CORRESPONDENCE

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CAREFULLY tucked away in the files of the Manuscript Division of the Library of Congress and in the archives of Widener Library and Houghton Library at Harvard University are the two ends of a correspondence that stirs the imagination and quickens the pulse of the scientist or historian interested in scientific Americana of the late nineteenth century. The correspondents are two of the greatest intellects ever produced in America and their exchange of opinion regarding matters scientific and personal serves as an interesting personalized documentation of the scientific thought of their period. The renowned astronomer, Simon Newcomb, considered the sheaf of letters from Charles S. Peirce important enough to file away with those of other important men in science whom he knew. Peirce, America's belatedly recognized giant in logic and philosophy, preserved a number of Newcomb's letters as well as the drafts of some of his letters to Newcomb of which we have no other record. The correspondence is being published herein for the first time.[1] It is not all continuous although most of it lies in the period 1889–1894.

The fact that the two men were compatriots and contemporaries in science almost year for year in a time of unprecedented scientific inquiry and discovery suggests an inevitable personal and professional contact in the circumscribed society of American scientific life in those days. A short sketch of their lives will account for this exchange of opinion and criticism in their later years.

Although he was born a Canadian in the remote town of Wallace, Nova Scotia, Newcomb's heritage was as thoroughly New England as that of Peirce. Newcomb's father was a teacher, as was Peirce's father, the renowned Benjamin. However, while Newcomb the elder moved frequently from place to place in Nova Scotia to eke out a subsistence living, Benjamin Peirce was firmly established in Cambridge as one of the adornments of the Harvard faculty in the Professorship of Natural Philosophy and Mathematics. Charles was born into comfortable, upper middle class surroundings with the silver spoon of the intellectual aristocracy planted firmly in his mouth.

Both boys were avid readers of whatever came to hand. Neither needed much help in the conquest of elementary mathematics. Newcomb tells of his state of rapture when he stumbled, at the age of fifteen, on the beauties of *Euclid* in his grandfather's copy of the Simpson edition.[2] At the age of thirteen, Peirce came upon his brother's copy of Whately's *Logic* and at once absorbed the principles set forth in the text.

Newcomb was only thirteen years old when he was hired out by his father as a manual laborer to ease the financial strains at home. After three years, the boy had the opportunity to apprentice himself to a "man of science," a doctor who turned out to be a quack. Flight from what then proved to be an intolerable bondage brought him to the shelter of this country which his forebears had left for the deeper wilderness of the north. By the time he was nineteen, Newcomb reached Maryland, and accepted a teaching post in a country school. In 1856 he was employed as a tutor in a family on a plantation whose proximity to Washington at last brought him into a world where men "wrote books" and people "knew the men who wrote books."[3] The hunger for books took him to the Smithsonian

[1] The correspondence was discovered by the writer while doing research for a book on the activities of Charles S. Peirce as a historian of science under a grant from the American Philosophical Society. It is being published with the permission of the heirs of both men and of the Philosophy Department of Harvard University. The writer is indebted to Dr. Elizabeth McPherson of the Library of Congress who was first to suggest the possible existence of Peirce materials in the Newcomb Collection in the Manuscript Division.

[2] *Reminiscences of an astronomer*, by Simon Newcomb, 14, 17, 18.

[3] An excellent short account of Newcomb's life and work is found in the *Memoirs of the National Academy of Science* **17**, 1924, by W. W. Campbell. Three additional papers by R. C. Archibald are of much value: Simon Newcomb (1835–1909). Bibliography of his life and work, *Science*, n. s. **44** (1147): 871–878, Dec. 22, 1916; an earlier version of the foregoing in *The Proceedings and Transactions of the Royal Society of Canada*, 1905, 2nd ser., **11** Sect. III: 79; biographical note in the *Semicentennial history of the American Mathematical Society*, 124–139.

Institution where he met Joseph Henry and J. E. Hilgard. These two men, recognizing the young man's ability, sought to place him at first in the Coast Survey. But nothing came of their hope. Later their sponsorship led him at the age of twenty-two "into the world of sweetness and light on one frosty morning in January, 1857," when he took his seat as a computer between Joseph Winlock and John Runkle "before a blazing fire in the office of the 'Nautical Almanac' at Cambridge, Mass."[4]

The official routine of the Almanac office permitted great flexibility in the arrangement of working hours and thus made it possible for Newcomb to join the Lawrence Scientific School "early in '57 for the purpose of studying mathematics under Professor Benjamin Peirce."[5] He was graduated Bachelor of Science in 1858 and for the three ensuing years was classified as a resident graduate.

Charles Peirce, in his youth, had been under the personal tutelage of his father, and was prepared by the age of sixteen to enter Harvard College.[6] He was graduated without any particular distinction by the College in 1859 and was given an assignment as aid in the Coast Survey to which he was formally appointed in 1861. He, too, found it possible to do this work and attend classes simultaneously at the Lawrence Scientific School. With a specialization in chemistry, Peirce was graduated a Bachelor of Science in 1863, the first *summa cum laude* from that institution; he had been graduated a Master of Arts from Harvard University the year before.

Perhaps the fact that Peirce was four years younger than Newcomb and the fact that Newcomb lacked social roots in Cambridge accounted to a large extent for the surprising lack of evidence of a personal friendship such as Peirce enjoyed at the time with Alexander Agassiz or with William James or even, in a more formal way, with Chauncey Wright. However, a genuine friendliness between Peirce *père* and Newcomb was marked by mutual respect and esteem. When Charles boasts in his writings, as he often does, of the scientific élite who regularly visited his renowned father at home, Newcomb's name is invariably listed among the callers. Moreover, a warm friendship seems to have existed between Newcomb and Charles Henry Davis,[7] Benjamin's brother-in-law and Charles' uncle. Davis was Superintendent of the Nautical Almanac Office and in 1865 became Superintendent of the Naval Observatory, where Newcomb had been assigned also as a Professor of Mathematics in the Navy.[8]

In 1870 the United States Government sent a solar eclipse expedition to the Mediterranean under the direction of Benjamin Peirce who took with him, among others, the two young men. Newcomb was in the party stationed at Gibraltar while Charles did his observing in Sicily.

The friendship between Benjamin Peirce and Newcomb must have been strengthened by the overlap in their work in the Nautical Almanac Office, for Benjamin had been Consulting Astronomer to this agency since its organization in 1849. Later, in 1875, when Benjamin learned that Charles would not be considered as a candidate for the post of Director of the Harvard Observatory, he threw his considerable scientific weight to the support of Newcomb for the coveted position. He was unable to persuade Newcomb to consider an offer which had been made by President Eliot. Newcomb wanted the Observatory post no more than that of the Superintendency of the Coast Survey which Sylvester had urged him to seek after Patterson's resignation in 1881.[9] Two years later, on September 15, 1877, Newcomb became head of the Nautical Almanac Office.

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[4] *Reminiscences of an astronomer*, 1.

[5] Letter to Rev. J. Walker from Newcomb dated March 25, 1857, re conditions for prizes. Sent from Nautical Almanac Office. Now in the archives of Widener Library. Mrs. Elaine Trehub, then of the library staff, brought it to the attention of the writer. The writer wishes to express her gratitude to Mr. Kimball Elkins, Senior Assistant in the Archives, and to Mr. Clifford Shipton, Custodian of the Archives, for securing the permission of Harvard University to use this material.

[6] No definitive biography of Peirce has as yet been written. There is a short biographical account by Paul Weiss in the *American Dictionary of Biography*.

[7] Davis' paternal attitude toward Newcomb is revealed in "Formative influences," by Simon Newcomb, *Forum* **11**: 183–191, Mar.–Aug. 1891. See also "Professor Benjamin Peirce," by Newcomb, *Proceedings of the Royal Society of Edinburgh* **11**: 739–742, Nov. 1880–July 1882.

[8] Newcomb was appointed by President Lincoln in 1861.

[9] *Osiris* **1**: 85–154. "Unpublished letters of James Joseph Sylvester and other new information concerning his life and work" by Raymond Clare Archibald. In a letter to Newcomb dated Oct. 20, 1881, Sylvester writes, "Who is to be the new superintendent of the Coast Survey? Why should you not allow it to be known that you would accept the appointment supposing you would be willing to do so!" Sylvester was the eminent British mathematician who served as the first chairman of the Department of Mathematics at the Johns Hopkins University (1876–1883). He returned to England in 1884 to occupy the chair of Savilian Professor of Geometry at Oxford.

Just as the official work of Benjamin Peirce and Newcomb had overlapped, so did that of Charles and Newcomb although they were affiliated with two different government agencies. For example, after Charles had begun his pendulum-swinging experiments as the Assistant in the Coast Survey in charge of the measurement of gravity, he mentioned in a report[10] that Newcomb had seemed to discover a possible new factor adding further difficulty to the pendulum-swinging problem. Again, when Peirce needed the calculations and map of the eclipse of June 29, 1878,[11] Newcomb was asked to furnish copies of the same. When, much later, Peirce was on the defensive against Superintendent Mendenhall's attack on the "backwardness of his work," he countered with, "Now anybody who has ever done such work in such a way,—ask such men as Langley or Newcomb,—will tell you that it is impossible to make any reliable estimate of how much time it will take."[12]

While Newcomb was building his scientific career in the Nautical Almanac Office and at the Naval Observatory, Charles Peirce was acquiring a not inconsiderable scientific reputation in the Coast Survey on three counts. His photometric researches[13] at the Harvard College Observatory brought him recognition as a first-rate astronomer; his pendulum work in Europe as well as in America brought him international recognition; and his measurement of the meter from the wave length of light was applauded at the time and proved to be the forerunner of similar work by Michelson and Morley.[14] Newcomb was later to attempt with Michelson to measure the velocity of light.[15]

Their scientific reputation brought both men membership in the National Academy of Science, Newcomb in 1869 and Peirce in 1877, where both later became members of the important Academy Committee on Weights and Measures.

Other similarities in interests and activities are numerous, but only a few of the more significant will be mentioned. In 1871, after fulfilling the duties of his solar eclipse expedition assignment, Newcomb "holed-in" at the Paris Observatory library, within ear-shot of the besieging nationalist forces, to make a study of the records of earlier astronomers, beginning with 1675, of the occultations of bright stars by the moon. He later considered this the most important "find" he ever made, for he was able, as a result of these studies, to confirm his suspicions that Hansen's tables, then in general use, were unreliable. Charles Peirce, driven similarly by an interest in past scientific achievement and a need to utilize historical documentary evidence in current scientific researches, made a thorough study of a manuscript of a thirteenth-century work[16] at the Bibliothèque Nationale while on an official Coast Survey mission in Paris.

Both men had teaching experience, and in both cases it was severely curtailed. In Newcomb's case the pressure of other responsibilities made it impossible for him to devote full time to an academic career.[17] In Peirce's case personal eccentricities and an inability to work in harmony and "in harness" with others was to frustrate continually his ardent desire for a formal academic connection.

Although creative mathematical skill was incidental to the work of both men, Peirce regarded

[10] From a letter dated July 1, 1873, in the Coast Survey files in the National Archives in Washington. Peirce writes, "Newcomb, in a paper in the last *Ast. Nachrichten*, says he finds that pendulums hung by springs twist and untwist as they oscillate and says this will affect the time of oscillation."

[11] *Ibid.* A letter dated April 26, 1878.

[12] National Archives. From a letter dated March 30, 1888. When Chas. A. Schott, Assistant in charge of the Computing Division of the Coast Survey, was asked to investigate a certain aspect of Peirce's procedure, he approved of it and added, "vide Prof. Newcomb's investigation to free the so-called standard R. A.'s from periodic errors; Wash. Obs. 1870." This remark is from a footnote to a letter to Superintendent Patterson dated Jan. 14, 1879.

[13] Photometric researches, in the *Annals of the Harvard College Observatory* 9, by Charles S. Peirce.

The writer read a paper entitled: Charles S. Peirce, nineteenth century man of science, to the Met. N. Y. Section of the History of Science Society on November 27, 1956. A similar paper has been accepted for publication in *Scripta Mathematica* in the near future.

[14] Michelson and Morley suggested the wave length of sodium light as the standard of measure.

[15] Under a Congressional appropriation, Newcomb worked in Washington while Michelson experimented in Cleveland (1880–1882).

[16] The *Epistle of Petrus Peregrinus on the lodestone*, Paris MS. No. 7378.

[17] Newcomb's professorship of mathematics in the Navy has already been mentioned. He later became Professor of Mathematics and Astronomy at the Johns Hopkins University (1884–1893; 1898–1900. Lecturer from 1876 to 1883). Peirce had lectured on the philosophy of science at Harvard (1864–1865); on philosophy (1869–1870); and on logic (1870–1871). He lectured at the Lowell Institute on the logic of science in 1866. He became a Lecturer on Logic under the auspices of the Mathematics Department under Sylvester at the Johns Hopkins University in the period 1879–1884. The official phrasing of the records veils, perhaps forever, the mystery of Peirce's enforced detachment from the University at a critical period of his life.

Newcomb as essentially a practical astronomer.[18] And yet Newcomb was later to be elected for the years 1897 and 1898 to the office of President of the American Mathematical Society, one of the many positions of high honor which he held in his lifetime.[19] Peirce's self-admitted primary interest and creative talent lay in the area of logic, especially the logic of scientific method. Because both men developed an unusually wide range of interests, both were asked to write extensively for newspapers and periodicals and both were members of editorial boards of dictionaries and encyclopedias. Newcomb wrote numerous books of popular interest in a facile style. Peirce, however, was to find it impossible to produce the manuscripts that would have made his work known in the longer book form.[20]

Later in life their careers again diverged. Newcomb, having retired at the mandatory age of sixty-two from the Nautical Almanac Office, was able to continue many of his professional activities. This was especially true of his important lunar studies which enjoyed the patronage of the Carnegie Institution after his retirement.[21] This support was first granted in 1903 and Newcomb continued with the work almost to the end of his life. He was highly revered and honored, decorated by foreign governments, a member of every important honorary scientific organization in the western world, and president of many learned societies. He seems indeed to have been a notable product of the studious application of his favorite motto, "Whatsoever thy hand findeth to do, do it with all thy might."

Peirce's unhappy star, on the other hand, brought him, despite the recognition of his valuable contributions to logic and his earlier celebrated work in science, such insecurity and misery that only the generous solicitude of a small group of sympathizers, headed by the noble William James, rescued him from actual destitution in the last years of his life. For the files of the Assistants' Correspondence in the National Archives, written in the decade after Benjamin's death in 1880, reveal the tragic story of the gradual decline in value to the Survey of Peirce's service as a member of that organization. His increasing inability to participate harmoniously in close teamwork with his colleagues led to personal skirmishes with Thorn, the "lawyer" Superintendent (1885–1889). Peirce's contemptuous attitude, as revealed in his letters, toward what he considered the scientific ineptitude of Mendenhall, Thorn's successor, rendered inevitable his own resignation from the ranks of the Survey in 1891.

Furthermore, despite Peirce's pretensions to sound business acumen, he found himself by the mid-nineties divested of family inheritance as well as the regular source of income which the Survey attachment had assured him. Beset by legal difficulties and faced with the permanent loss of his valuable library as well as the temporary loss of his Milford estate, "Arisbe," he found survival for himself and his wife barely possible by accepting numerous odd writing assignments, some of which will be referred to in the course of this paper. After negotiations had been concluded for him to use "Arisbe" as his permanent residence, he spent the remainder of his life working part of his land, writing and rewriting incessantly whenever the opportunity offered itself, and sending his manuscripts, whenever he was so employed, to the various publishers by mail. Occasionally he went farther afield to attend meetings of the National Academy of Science, to visit Langley on business at the Smithsonian,[22] or to lecture at Cambridge or in Boston.

And at the very end, Peirce became a victim of that dread malady, cancer. Strangely enough this disease was to fell Newcomb also. Both struggled to the very end to leave behind a precious heritage of ideas gleaned from a lifetime of

[18] Newcomb enjoyed a reputation as a political economist also.

[19] He became Vice-President of the American Philosophical Society on January 1, 1909. He had been elected to membership in the Society on January 18, 1878.

[20] The correspondence of Peirce with various publishers, now to be found in the Peirce Collection in the archives of Widener Library, reveals that Peirce had numerous opportunities to publish but either could or would not meet the conditions set by the publishers. References to details in correspondence other than that between Peirce and Newcomb in the Peirce Collection, are being made with the permission of the Philosophy Department at Harvard University.

[21] Established in 1902.

[22] Mr. H. W. Dorsey, who had been the Administrative Assistant to Secretary Langley in those days, recalled in a telephone conversation with the writer early in July, 1952, Pierce's ill-groomed appearance on such visits and the bitterness between Peirce and Langley created by the controversy over an article entitled by Peirce, "The laws of nature and Hume's arguments against miracles," which Peirce had prepared at Langley's request for publication by the Smithsonian Institution. The correspondence between Peirce and Langley on this subject has been published by Philip P. Wiener in *Proc. Amer. Philos. Soc.* **91** (2): 201–228, 1947. Further details appear in a paper by the writer in *Jour. Hist. Ideas*, Oct., 1957. It is entitled: The scientist-philosopher C. S. Peirce at the Smithsonian.

rich experience. Each man was just past seventy-four at the time of his death.[23]

In closing this brief outline of the careers of these men, it may be well to quote some of Peirce's opinion of Newcomb's work. What Peirce's opinion of Newcomb's contributions to the science of his time had been is obvious from the opening paragraph of his review[24] in the *Nation* of Newcomb's *The Reminiscences of an Astronomer*. It is expressed in the words,

> Newcomb is quite the most distinguished man of science in this country to-day, as well as one of the most eminent in the whole world. His name will remain upon the page of scientific history, and eventually take its place high in the second rank, distinctly above Leverrier's or even Hansen's because of the breadth of his work.

Earlier, in 1901, Peirce had written in the opening article for the *Post*, in its special issue dedicated to a Review of the XIXth Century,[25]

> Thus it happens that we have a magnificent group of great astronomers living among us to-day. We stand too close to them to take in their true proportions. But it is certain that the names of Chandler, Langley, Newcomb, Pickering, and several others are indelibly inscribed upon the heavens.

It is remarkable that Peirce could have so clearly anticipated what the judgment of Newcomb's work by the next generation was to be. For his opinion was confirmed a quarter of a century later when Albert Einstein wrote to a daughter[26] of Newcomb, "Your father's life-work is of monumental importance to astronomy." He mentioned especially her father's contributions to the calculus of perturbations. It was noted in the "Sketch of Simon Newcomb" that Newcomb "had at times remarked that a new law of nature must be discovered to explain the discrepancy between the calculated and observed positions of Mercury," and that, "Soon afterward the theory of relativity seemed to be this new law." Einstein concluded his letter with the sentence, "It was thus that the theory of relativity completed the work of the calculus of perturbations and brought about a full agreement between theory and experience." Without the foreknowledge of the scientific edifice which Newcomb's labors were capable of supporting, Peirce had judged his man fairly and well.

Newcomb's estimate of Peirce's general capabilities as a logician and scientist is difficult to judge, for materials with such references seem to be no longer extant. The correspondence which follows reflects Newcomb's judgment of Peirce's thought as regards numerous specific matters, mathematical and otherwise.

The first item[27] in the correspondence, chronologically speaking, reflects not only Newcomb's interest in political economy but Peirce's approach to questions in that field too. In the last of the series of five papers written for the *Monist* in 1893,[28] the paper entitled "Evolutionary Love," Peirce takes full advantage of an opportunity to castigate the author of a "handbook of political economy—the most typical and middling one I have at hand"—because the author had conferred the title "love of self" on what Peirce called pure greed. The handbook was the *Principles of Political Economy* (1886) and the author was Simon Newcomb. Writing in a similar vein in a manuscript of about 1906,[29] Peirce recalls and reaffirms at this late date his earlier reactions to Newcomb's work.

> I remember two passages in my writings in which I made as much fun as politeness would allow of writers who undertook to tell us what was "conducive to our welfare." Once it was Simon Newcomb who was talking like that in his book on Political Economy; and I remarked that an economist, far from having any qualifications for exploring this most occult of all matters, was particularly unfit for the task owing to his habit of taking it for granted that wealth was desirable.

[23] Simon Newcomb (March 12, 1835–July 11, 1909). Charles S. Peirce (Sept. 10, 1839–April 19, 1914).

[24] 78 (2021): 237. March 24, 1904.

[25] The Century's great men in science, Sat. Jan. 12, 1901. Peirce contributed the leading article to the *Post's* Review of the XIXth century. On the second page the leading article was by Newcomb and was entitled: Advance in astronomical science.

[26] *Science*, n. s. No. 69: 248–249, March 1, 1929. Dr. Einstein sent this letter from Berlin to Mrs. Josepha Whitney on July 15, 1926. It is found also in a pamphlet entitled "A brief sketch of Simon Newcomb" which was prepared by this daughter and submitted by her and her sisters Anita McGee and Emily N. Wilson to the Electors of the Hall of Fame of New York University. Copy in Butler Library at Columbia University.

[27] From the Newcomb Collection, MS. Division, Library of Congress. The writer has made an effort to clarify all allusions in each letter. Limitations of space do not permit a mathematical analysis of detail in this paper. The writer has in preparation a critical review of Peirce's mathematical contributions.

[28] *The collected papers of Charles S. Peirce*, edited by Charles Hartshorne and Paul Weiss (6.291). Also found in *Chance, love, and logic* by Morris R. Cohen.

[29] *Ibid.*, 6.517.

One of the earliest attempts at an exchange of opinion on this subject has been preserved in the first item.

Dec. 17, 1871

U. S. Coast Survey Office
Washington

Dear Sir

What I meant by saying that the law of Supply and Demand only holds for unlimited competition is this. I take the law to be, that the price of an article will be such that the amount the producers can supply at that price with the greatest total profit, is equal to what the consumers will take at that price. This is the case with unlimited competition because nothing that any individual producer does will have an appreciable effect on the price; therefore he simply produces as much as he can profitably. But when production is not thus stimulated, the price will be higher and at that higher price a greater amount might be profitably supplied.

To state this algebraically:—

The amount that can be profitably produced at a certain price X is the value of y which makes $(X_y - z)$ a maximum so that $X - D_y z = 0$. But the price x which the producer will set will be that which will make $(xy - z)$ a maximum so that $y + D_x y(x - D_y z) = 0$.

Clearly $x > X$ because $D_x y < 0$. In the case of unlimited competition, however, the price is not at all influenced by any single producer so that x is constant $D_x y = \infty$ and then the second equation reduces to the first. If this differentiation by a constant seems outlandish, you can get the same result another way. But it is right for if the producer, in this case, lowers his price below what is best for him there will be an immense run upon him, if he raises it above that he will have no sales at all, so that $D_x y = -\infty$.

If the law of demand and supply is stated as meaning that no more will be produced than can be sold, then it shows the limitation of production, but is not a law regulating the price.

Yours very truly
C. S. Peirce

Prof. Simon Newcomb U. S. N.
Observatory
P. S. This is all in Cournot

Next in sequence is the draft of an incomplete letter[30] written by Peirce after Sylvester had returned to England and Newcomb had succeeded him in the position of Editor-in-Chief of the *American Journal of Mathematics* for the periods 1885–1893 and 1899–1900. There seems to have been considerable friction regarding the material Peirce wished to have published in that *Journal*, for echoes of his complaints about Newcomb's lack of cooperation are heard in many places. For example he writes in one place,[31]

I wrote out in 1885 a full systematic exposition of the notation and its use: but I did not print it. Indeed, it was, in effect, refused by the editor of the *Am. J. Math.*, Simon Newcomb, who said he would print it, if I would declare it was a mathematical paper. That I could not do.

Milford, Pa. 1889 Jan. 17

My dear Newcomb:

If the following proposition be not too well-known or obvious, possibly the proof I give of it may be worth filling up some corner of your journal with sometime.

Through a point in space let 4 right lines be drawn. Let 4 points, assumed one on each of these lines, be taken as the vertices of a tetrahedron; and let a second tetrahedron be formed in the same way. Then the lines of intersection of corresponding planes of the tetrahedron lie in one plane.

Proof. Suppose we have a system of Cartesian or homogeneous coordinates, but that all the equations contain terms in an additional and meaningless variable, which has to be eliminated. This the same as regarding the 3-dimensional space as a perspective from a 4-dimensional space. A single equation has no meaning, except considered as determining a 3-dimensional space. Two linear equations determine a plane, 3 a line, 4 a point then, any 3 lines determine . . . .

Incomplete

The third item[32] in the correspondence has led to the discovery of a most interesting public con-

[30] From the "fragments" of the Peirce Collection in the tunnel of Houghton Library at Harvard University. Another draft of this letter is found in the Charles S. Peirce Collection of the University Archives section of the Harvard College Library (1A Math. Box 4). It, too, is incomplete. It opens thus: "The following proposition must be included virtually in Hamilton's discussion of nets in space; but it is not stated by him and does not seem to me obvious. It may be well-known.

"Through a point in space describe four right lines. Assume a point on each and make these four points the vertices of a tetrahedron. Assume a second set of four points on the four right lines and make them the vertices of a second tetrahedron. Then corresponding faces of the tetrahedrons, being produced, cut one another in 4 complanar lines.

"The proof is excessively simple."

A third draft, identical with the above, is found in the Peirce Collection, Box V B2b.

[31] *Ibid.* 1A Math Box 4, folder 29.

[32] Newcomb Collection, MS. Division, Library of Congress.

troversy between Newcomb and Peirce in the columns of the *Nation*.

After the publication in 1889 of the *Century Dictionary* of which Peirce was an Associate Editor, a review of it appeared in the *Nation* on May 30.[33] The issue of June 13[34] carried a "Letter to the Editor of the Nation" which opened with the remark that "Your recent review of the 'Century Dictionary' ought to be supplemented by some remarks upon its definitions of terms in physical science, while there is still time to make corrections." Among the terms itemized and discussed is the *Law of action and reaction*. The letter concludes with the sentence, "It ought to be added that, so far as I have noticed, the definitions in mathematics and mathematical physics are not subject to this criticism." It is signed by Simon Newcomb.[35]

On June 20 an answer appeared in the "correspondence" section of that issue of the *Nation*.[36] It had been sent by Charles S. Peirce and in it he admitted authorship of the definitions under fire. He explained, among other things, that an important sentence from the *Principia* had been inadvertently omitted from the definition of Newton's "law of action and reaction" under the general discussion of the term *action*.

Newcomb replied in the next issue[37] which appeared on June 27. He expressed great surprise that Peirce had been responsible for the definitions under attack and writes, "The contrast which I mentioned between the definitions in mathematics and mathematical physics and those in astronomy and experimental physics I supposed to mark the line between his work and that of some less skilful hand." As for the *Law of action and reaction*, Newcomb could find no such definition in the *Principia*. He finally ends the letter with the sentence, "*Argus*, the constellation, is omitted, though *Aries* and *Aquarius* are included."

109 East 15th Street Century Club 1889 July 2
My dear Newcomb

As it doesn't seem very becoming for us to be disputing about *Argo* or *Argus* and the like, I won't answer your last (in) the Nation. But I am in a situation to know that such a criticism as yours tells upon the sales of the work. You will find the definition of action in the Principia toward the end of the Leges Motus. "Nam si æstimetur agentis actio ex ejus vi et velocitate, conjunction," etc.

Yours faithfully
C. S. Pierce

The series of letters[38] which next appears seems to have originated in Newcomb's aforementioned criticism of several of Peirce's definitions in the Century Dictionary. Although the reputations of both men had brought them the opportunity to serve as contributing editors on the staffs of dictionaries and encyclopedias,[39] each entertained a very low opinion of the competence of the other in that work. There exists an early draft of a letter[40] which Peirce presumably sent to Professor Baldwin at Princeton in which he severely criticizes "Newcomb's articles" for that dictionary. He reveals also that Newcomb had written to him and had said that Peirce's

views about limits were forty years behind the time. The correspondence which followed showed he [Newcomb] had not read any of the remarkable works on the logic of mathematics of late years and in short what it came to was that I was returning to a view which the nominalism of forty years before had persuaded him was wrong and he had not advanced a step since that time.

Peirce claimed also that Newcomb's views were "very narrow both on the philosophical and on the mathematical side"[41] and that he therefore

[33] No. 1248, p. 450.
[34] No. 1250, p. 488.
[35] Sent from Washington on June 8.
[36] No. 1251, p. 504. Sent from Milford, Pa., on June 14.
[37] No. 1252, p. 524.

[38] Nov. 30, 1890, Peirce MS. fragments at Houghton Library. Dec. 12, 1890, Peirce MS. fragments at Houghton Library. (. . .), 1890, Peirce Collection, Widener Library archives. Box VB2b. The upper right hand corner has been torn from the sheaf of pages of the last letter. The missing words are indicated by dots.

[39] Newcomb was an associate editor of Johnson's *Universal Cyclopedia* and of Funk and Wagnall's *Standard Dictionary*. He was mathematics editor with H. B. Fine of Baldwin's *Dictionary of Philosophy and Psychology*. Peirce was a contributing editor to the *Century Dictionary*. He was logic editor with C. Ladd-Franklin of Baldwin's *Dictionary*. He was color editor of Funk and Wagnall's *Standard Dictionary* until he was dropped for failure to meet deadlines.

[40] Written Oct. 20, 1900. Peirce Collection at Widener Library, Box VB2C.

[41] Written Dec. 26, 1900. Peirce Collection. General Correspondence, Widener Library. Peirce also said, "He is not a mathematician or at any rate has only become so late in life,—he is only a mathematical astronomer." See footnote 40. G. W. Hill, the famous mathematician on the staff of the Nautical Almanac, confirmed this opinion of Newcomb in an obituary note (*Science*, n. s. **30**(768): 353–357, Sept. 17, 1909). He said, "While Professor Newcomb wished always to be accounted a mathematician,

intended "to pitch into his articles and try to render them serviceable to students of philosophy."

There is an obvious "give and take" in these disputes between the two men. Moreover, lest the reader form the impression that Peirce's intellectual aggression was centered on Newcomb, other instances of it are cited. Unpublished correspondence, for example, in the archives at Widener Library reveals that Peirce had protested against Professor Fine's definition of *continuity* in the same dictionary. Fine retaliated[42] by questioning Peirce's use of the mathematical term *discrete*. Again, when Royce's Supplementary Essay on *The World and the Individual* appeared, Peirce's critical reaction impelled him to contribute a long article entitled "Infinitesimals"[43] to the Editor of *Science* who promptly published it.

Since the logical foundations and fundamental definitions in certain areas of mathematics were being questioned on all sides at that time, these letters serve as a peep-hole into the scene of the struggle for basic agreement on the direction of the further development of the subject.[44] The first of the letters in the series opens with the words

Don't revile me for this bulky document; but put it aside till you feel disposed to look at it.

Milford Pa 1890 Nov 30

My dear Newcomb:

It is you I am sure who write, although your letter is not signed; and it is always of great advantage to me to have your criticisms. I infer, however, that you have not read the important papers of G. Cantor, which are condensed in Vol 3 of the Acta Mathematica. I do not agree with the whole of Cantor's conclusion, but regard his most fundamental points as established and among others we can perfectly well reason about infinite quantities. However, I do not derive this opinion from Cantor, but had already before seeing these papers reached demonstrative conviction of this. In fact the general forms of reasoning are perfectly applicable to infinite quantities, and it is finite quantities which are peculiar in that certain modes of influence hold in regard to them which do not hold with regard to objects in general.

In my definition of the doctrine of Limits I have thrown a sop to Cerberus by the remark that the best contention in favor of that doctrine was that nothing having no reference to conceivable experience could have any meaning, and therefore phrases relating to infinity must be interpreted as having some relation to what might be experienced. This is true; but I might have added that this principle does not suffice to indicate the Doctrine of Limits since infinite quantities are capable of being conceived as objects of experience, though not of measurement.

I find no fault with the doctrine of limits except that it is an unnecessary going about, founded on a logic that is no logic but a mere hampering by an association of ideas. The notion that reasoning about finite quantities is easy and intelligible, that about infinites incomprehensible, simply arises from strictly logical analysis being replaced by an intuitional process which does not easily generalize itself, or rise to wider occasions.

You say that if $A - B$ is less than every finite quantity, "*it follows*" that $A = B$ that is, that $A - B$ is zero. "*For*", you say, if A is not equal to B, their difference must be finite. But it seems to me that this is neither more nor less than what you have to prove.

The situation is precisely that of the non Euclidean geometry a few years ago. You say $A + h = A$ when h is infinitesimal is illogical or *inexact*. You of course admit, however, that $A + 0 = A$. So that you hold that an infinitesimal differs from zero. Of course, one way of urging the doctrine of limits is to say that differentials are really finite quantities. This, no doubt, is what you mean. You hold that $(A + h)^2 = A^2 + 2Ah$ approaches nearer and nearer to the truth without limit when h is diminished and is exactly true for $h = 0$. You regard it as inexact when h is infinitesimal. At

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his work seems motivated by its possible application to astronomy, and no very weighty contribution from his pen has accrued to pure mathematics."

[42] Jan. 14, 1901. Peirce Collection. General Correspondence, Widener Library.

[43] *Science*, n. s. **11** (272): 430–433, Mar. 16, 1900. Dated Feb. 18, 1900. In a ten-issue article called: Zeno's arguments on motion, Cajori says in the *Amer. Math. Mo.* **22**: 220. "In America C. S. Peirce has adhered to the idea of infinitesimals in the declaration: 'The illumination of the subject by a strict notation for the logic of relatives had shown me clearly and evidently that the idea of an infinitesimal involves no contradiction.' Apparently, before he acquired familiarity with the writings of Dedekind and Georg Cantor, C. S. Peirce had firmly recognized that for infinite collections the axiom, that the whole is greater than its part, does not hold."

Peirce reviewed vol. I of Royce's work in the *Nation*, **70** (1814): 267, Ap. 5, 1900; vol. II in **75** (1935): 94, July 31, 1902.

[44] Peirce's definitions of *limit*, *doctrine of limits*, and *infinitesimal* are to be found in the *Century Dictionary*. Newcomb's definitions of *infinite*, *infinitesimal*, *limit* are in the 1901 Appleton edition of *Johnson's Cyclopedia*. Newcomb wrote a paper entitled: Remarks on the doctrine of limits, in the *Analyst* No. 9: 114, 1882. In it he discusses definitions from Wood and Wentworth.

least, that is your language; but you do not mean by it what I should do, taking it literally.

The results of the differential calculus can undoubtedly be reached through the doctrine of limits. It is an attractive method too. But in my opinion it is just as wrong as to reach the results of the imaginary calculus by means of an interpretation of imaginaries. "Wrong" in the sense of unphilosophical I mean, not incorrect.

Very faithfully,
C. S. Peirce

Milford 1890 Dec. 12

My dear Newcomb:

It is very gratifying to me to get so prompt a reply to my letter. I am confident discussion of these points must bring us to or toward an agreement.

1.—You say my treatment of *limit* and *infinitesimal* are not in accord with the best mathematical thought of the day. But allow me to say that as you have not read, or at least not deeply considered the papers of G. Cantor, you are in the situation toward the subject in which twenty years ago those mathematicians were who had not read or had not studied Lobatchewsky, in reference to that subject. If you were to say that my definitions mentioned are not in accord with the *prevalent* mathematical thought, perhaps you could prove your point; but I would rather be in accord with views which are in my opinion surely destined to prevail in a few years.

2.—You say you cannot comprehend what I mean by "the point at which a variable upon which a function depends passes through infinity."

I will explain. First, observe that I do not say there is such a variable when *limit* means simply boundary. Thus, where time passes from one day to the next, I do not say that at 0^h of the second day any variable considered passes through infinity. Second, I am not speaking of a variable connected with a function in a strictly definite manner. But when it is said that a limit is a value which a variable is conceived to approach indefinitely but never to reach, then I say there is an express reference to another variable. The words of *approach* and *never* are words of time and relate to some vaguely conceived variable. The word *never* indicated the point where *that* variable, assimilated to time in the language used, passes through infinity. I imagine (see figure) in a plane a line rotating about one of its intersections with a curve. As it turns (clockwise), the other intersection runs from the left up toward the fixed intersection. In this conception, the vague variable imagined as time is introduced. If the rotation is something like uniform, the position for which the secant becomes a tangent is a mere boundary between left-handed and right-handed intersections. But in the differential calculus, those who use the doctrine of limits say that the tangent is the limit toward which the secant tends when its second intersection *indefinitely approaches* the first. To "indefinitely approach," can only mean, as some writers distinctly state, to approach closer than any given finite distance but *never* reach. Such approach supposes something imagined as time running on to infinity.

I think the *first* moment of my idea, that the idea of a limit, as used in the differential calculus, involves the idea of a variable (i.e. a vague variable) passing through infinity where the state of things called the limit is reached, is thus made clear. But there is a *second* moment of my thought, namely that this vague variable is only *passing through* infinity. I think it is quite in accordance with "the best mathematical thought of the day" to regard the value *infinity* as a mere point through which a variable passes without coming to any abrupt termination there or anywhere. Of course, the real thing which the mathematical object simulates may do so, but pure mathematical lines join themselves though (as in hyperbolic geometry) they have to pass through a region of imaginary values before they do so. And in pure mathematics there is no difference between a line and a linear quantity, unless a mere point of view. So that when it is said that a variable "never" reaches its limit, that will not prevent our conceiving it as getting there and *passing through* it, all the same.

3.—You say you object to my definition of limit, "*totally*." Now let us see what it is. I give first a generic definition, and then a specific one under it. (After which I criticize another definition which I do not assent to.) The general definition is: "the precise boundary between two continuous regions of magnitude or quantity." Thus, a tangent is the precise boundary between the region of *neighboring* right-handed secants and neighboring left-handed secants. I then give a specific definition under that: "the point at which a variable upon which some function depends passes through infinity." I have shown above why I give the first as the universal meaning, and why and how I hold that as used by writers on the differential calculus it really has the second meaning, though they fail to make themselves perfectly clear about it, even to themselves.

4.—The definition then given and criticized is *not* "intended to be the sense in which the word is always used." It is intended to be a statement of an attempt frequently made to analyze the usual

meaning in the differential calculus. You say I am wrong in describing this definition as tacitly assuming that the variable depends upon another. I did not intend *quite* to say that, for I do not think it *quite* true. It would be true, if for "tacitly" we read "expressly." But *that* is not what I intended to say, for *that* is a statement to which I should not *object* at all. What I object to about the definition is, in the first place, that it assumes this vague variable, which I fully admit, *to increase by finite steps*. The variable it *expressly* and rightly asserts. The increment by finite steps it *tacitly* and *unnecessarily* assumes. This criticism I shall not defend because you do not attack it.

5.—You say you do not understand what I mean by saying that that definition's "overlooking the essential cond[it]ions of continuity." But that is not what I say. I say it overlooks the essential element of continuity. That is to say, it defines a limit by that very conception embodied by the word *infinitesimal* (which word I forgive because everybody overlooks or forgets its etymological meaning) namely as if it were nothing more than that toward which a series converges,—the sum of an infinite series. Here there is no *continuity*; while a limit, according to my notion of what people mean by it, is the boundary between two *continuous* regions.

6.—You say I do not define Method or doctrine of limits. I *profess* to do so. I do not *confine myself* to stating what I suppose to be its logical basis, nor do I state *at all* what I suppose to be its logical basis. I state what I conceive to be its *essence*; and that is as much as the dictionary can find room for in regard to any doctrine or method. Perhaps, I might have a little specimen of it.

7.—I don't understand what your proposition is about $a + i = a$. If a person adopts the conception of infinitesimals, this certainly seems a fundamental proposition of the calculus. If you adopt the method of limits an infinitesimal is regarded as the limit of a quantity that vanishes. That $A + \lim B = A$ when $\lim B = 0$ cannot well be denied, and this is all the meaning that an adherent to the doctrine of limits can see in $A + i = A$. But perhaps from that point of view it may not be a fundamental proposition.

8.—You say you think I am wrong as to mathematicians differing in regard to the interpretation of $A + i = A$. I think that shows you have not read recent discussions of infinitesimals etc. To support this you say all would agree that "all reasoning about infinitesimals and infinites" admits of being reduced to the forms of Euclid. If for the words in quotations you put "the results of the calculus, in regard to finite quantities," I admit it. Otherwise, it is quite indefensible. As for Euclid's axioms, I consider them as innocent as they are impotent,—except the ridiculous 9th, which has nothing to do with the subject. That "infinities and infinitesimals are non-existent in thought" you are altogether mistaken in supposing mathematicians agreed upon. This simply shows as I said you have not read the papers. In the next place, even if mathematicians were agreed on this psychological nonsense, it would not prove anything at all about the proposition $A + i = A$.

9.—You say you never heard of anyone claiming that we cannot reason correctly about *infinite quantities*. What? about *infinite quantities* strictly speaking, or about what the method of limits substitutes for them and calls by that name? What was the motive of Lagrange's Theorie des fonctions? The first book I pull out is Jordan's treatise where I read: "Quant à l'infini, il échappe à toute mesure et ne sauvait entrer dans un calcul."

Very faithfully
C. S. Peirce

Milford, Pa. 1890 (. . .)

My dear Newcomb:

Merry Christmas (. . . .) As you signify in your last that you have got through with your criticisms on my definitions of *infinitesimal*, *limit*, and *Doctrine of limits*, I will summarize them and my answers.

You "object to my definition of *limit* totally and of infinitesimal partially, as non-accordant with the best mathematical thought of the day, and savoring too much of notions current a century ago, and current still among men whose ideas are improperly co-ordinated."

Let us see by a review of the arguments whether you have succeeded in justifying this judgment or not.

Against my definition of *infinitesimal*, you object that I do not define it in terms of the doctrine of limits. I do refer to that mode of treatment, stating that it avoids sundry difficulties. I do not adopt as giving the (. . .) and accurate meaning of infinitesimal, (. . .) view which one of its chief defenders characterizes thus: "The method of limits is, in reality nothing more than one way of evading the use of the word infinite in its absolute sense." But this does not satisfy you. You thought "that for 50 years, at least, everyone who understood the subject accepted the view that an infinitesimal is simply a quantity approaching zero as its limit. In reply, I instanced Georg Cantor, when you remarked that the papers of Cantor "came before" you some years ago, but you could see nothing of value in them. Your expression suggests that you rejected something offered for the Am. J. Math. The editor of the Acta Mathematica, which I may without disrespect for your journal characterize as without doubt the most profound journal of mathematics published, saw so much in Cantor's papers that he gave up one entire number to them,—although most of them had already been published. The (. . .) excited a discussion in

which some of the (. . .) mathematical heads of our time have taken part. Not to be acquainted with them is to be unprepared to enter into a modern discussion of the conception of infinity.

In order to show the difficulties with which the doctrine of infinitesimals is beset, I had remarked that it was necessary, i being infinitesimal, to put $A + i = A$, an equation "representing" a fundamental proposition of the calculus.

You think this statement "illogical or inexact." It "simply astonishes" you. Your "objection" is simply that of the school-boy. If $A + i = A$, then, substracting A, it follows by Euclid's axiom, $i = 0$." In reply, I pointed out that I had indicated in the Dictionary two ways which had been resorted to to escape this. One is to say $i = 0$. That *zero* is subject to all the rules of algebra without exception will, I take it, hardly be disputed at this time of day. It is true (. . .) as you say, with an assured air that taken in connection with its accompanying unconsciousness of what has been going on in the logical world is charming, that "zero cannot be *treated as* a term of a ratio under any circumstances." You do not say how you would prove this proposition. The other way of escaping the difficulty about $A + i = A$, I said was, to regard the sign of equality as meaning measurable equality. In order to make my meaning clear to you, I supposed a telepathic communication with infinitesimal beings. We can measure A but not i; they can measure i but not A. Neither of us can measure any difference between $A + i$ and A, *as* a difference; though they can measure i.

In order to have successfully attacked my definitions, the one thing you would have had to show was that the idea of a quantity immeasurably small involves contradiction. This you have utterly failed to do; and have shown you were not properly (equipped) for the discussion.

However, you return to the equation $A + i = A$ in your last, and undertake to prove that it does not represent a fundamental proposition of the calculus. You propose to make this out by showing that the application of it is equivalent to the "passage to the limit." This, however, even if established would leave your proof incomplete. It would still remain to be shown that the passage to the limit is not a fundamental part of the doctrine of limits; a premise required by your reasoning, though it would have a double back action if granted.

But you do not show that the application of $A + i = A$ is equivalent to the passage to the limit. You only show, what was well known, that there is a close analogy and correspondence between the two ways of reasoning. There is an almost precisely similar analogy between scientific induction and the *reductio ad absurdum*. There was an ancient dispute between the Epicureans and Stoics, the former advocating the use of induction, the latter only allowing it in cases where it could be shown to be nothing but a *reductio ad absurdum*. (. . .) the logic of the doctrine of limits is as stupid and narrow as that of the Stoics, its consequences are not so bad, since it happens that the most important results really can be established by the method of limits.

On the whole, I have nothing to modify in my definition of *infinitesimal*, though I could have made the matter clearer in much greater space. It is to be remembered that it is no purpose of a dictionary to inculcate sound doctrine; it is simply to explain words, ideas, etc. Moreover it would not be expected that under *infinitesimal*, I should repeat all that has been put under *infinite*.

To my definition of the word limit, you "object totally." You "cannot comprehend what is meant by the point at which a variable upon which some function depends, passes through infinity." It would seem then that you are not *au fait* of what has been done of recent years concerning the foundations of the theory of functions. The fashionable definition of to-day, if I may use the expression, of a *limit* among the chief upholders of the doctrine of limits is the following. The limit of a variable, x, is a value, c, such that for every positive quantity, ϵ, sufficiently small, a value N can be assigned to a number n, making mod $(x_n - c) < \epsilon$ for every value of n exceeding N. Here in n you have the vague (variable) to which I refer becoming infinite at the limit. You will perceive therefore that the fact that you could not comprehend what I meant did not suffice to relegate me to the class of those whose ideas are imperfectly coordinated.

My definition departs from the fashionable one in two ways. First, it removes the unnecessary restriction that n must vary by discrete steps; since I regard the conception of *limit*, when understood in the way it must be understood to make it serve its purposes, as well as in the thought of most of those who employ it, as involving or, at least, not *excluding* the idea of continuity. In the second place, in the interest of co-ordination of ideas, I regard infinity, just as in projective geometry, as a value to be "passed through." But you must not suppose that when I thus vaguely describe my reason for treating the matter as I have done that my reason itself is vague. On the contrary, it rests on exact algebraic discussion of the reasoning concerning finite and infinite quantities which cannot be successfully controverted. To say of views so founded that they "savor of notions current a century ago" suffices to demolish them just as much as kicking the great pyramid would bring that down.

Having given my own definition of limit, I state the common one which I reject. I have to put this into popular language, and I use an expression which has often been used by the advocates of the way of limits. I admit that in the bare statement, without seeing how it is used, it is not *evident* to a person not very well up in the subject that the

statement in popular language is open to the charge of representing the vague variable as varying by discrete steps. Such however is the peculiar import of the word *never*.

I admit this definition is somewhat wanting in perspicuity. The vague variable requires explanation and the nature of the objection to the common definition needs elucidation.

I am unable to see however that you have shown my views to be antiquated or confused. It is you who do not seem to be aware of modern ideas.

We come now to the definition of the *doctrine of limits*. You say "I suppose there is a method of reasoning in mathematics called the method of limits . . . which method was employed by Euclid." This involves an inaccuracy in regard to the phrase which is serious as regards any criticism of my definition. Euclid uses in the 6th book a method of reasoning which Archimedes developed into the method of exhaustions. Supposing this method of reasoning were the essence of the method of limits, it would be far from true that Euclid used the method of limits. The difference is this: the method of exhaustions is a method of direct geometrical reasoning; the method of limits is a method of establishing the first propositions of the differential calculus. This is the language generally recognized by careful writers. The method of limits is a method of establishing the calculus without the use of true infinitesimals nor series by reasoning concerning the limits of finites. (. . .) such, it has several varieties. The one which you use, and which you would have me exclusively recognize, is not generally used, and is the least demonstrative of any.

You endeavor to make a distinction between the *method* and *doctrine* of limits, which I have treated as synonymous, by making the *doctrine* the "principles" of the *method*. But the distinction is not tenable. In establishing the propositions of the calculus it is necessary to enumerate the principles and there is none but a hair-splitting distinction between the method and the doctrine of limits.

You also think the latter "somewhat incorrectly" called the doctrine. I don't know what you have got in your head. It is like saying Ptolemy's Almagest discusses no "problems." If I know anything of the terminology of logic, the definition of *doctrine* in the Century Dictionary is correct: "the principles of any branch of knowledge; anything held for true."

In undertaking to state the essential characters of the doctrine of limits, I begin by saying that it rests on the idea that infinitesimals in the strict sense "cannot be reasoned about mathematically." To this you object, because you never heard of anybody's holding such an opinion. It is, nevertheless, the general opinion of those who adhere to the doctrine of limits. I have twice asked you whether you really mean to say that you hold that infinitesimals can be correctly reasoned about mathematically. To that you will not reply, because it is an argumentum ad hominem. To show, however, that I assume that dx is *not* infinitesimal (the very opposite of what I do assume) you say that I make it "subject to laws of multiplication." Now, this argument has no validity, unless I deny that infinitesimals are subject to the laws of algebra. So it appears that in your view those who hold the doctrine of limits as well as everybody else you ever heard of admit that infinitesimals are subject to mathematical reasoning, while those who adhere to the method of infinitesimals do not regard them as the subjects of such reasoning! You are all mixed up here. Those who consider that infinitesimals can be reasoned about mathematically have no need of resorting, and do not resort, to any adjurant theory for the differential calculus such as the doctrine of limits.

You say that I "object to the way in which" the doctrine of limits "has been defined in such a way as would lead the reader to suppose that the whole method was fallacious." This is a singularly hasty statement which will not bear examination, as you shall see. In the first place, I have raised no objection in the dictionary to any definition of the doctrine of limits. I have objected to a definition frequently given to "limit." But that does not lead any rational person to suppose the whole method of limits fallacious. To the doctrine of limits, I have made two criticisms. The first is, that the notion that we (cannot) reason directly about infinitesimals is unfounded. No sane person could conclude from that remark that indirect reasoning about them was fallacious. The second remark is that the method of infinitesimals "harmonizes better with recent advances in mathematics." If a reader is so thoughtless as to suppose this means the method of limits is in downright conflict with recent discoveries in mathematics, he will fall into the error you mention. I don't think there is much danger of that, but I will change to "is more in the spirit of modern mathematical philosophy," in another edition.

You say you "cannot gather whether" I "admit the validity of the method of limits or deny it." This I regard as high praise. I hope I may have treated all controverted doctrines in such a way that it is not easy to gather on which side of the controversy I range myself.

But I will mention that, in fact, if a *limit* is correctly defined, so that the approach to it may be continuous, and the great (distin . . .) of the discrete and continuous infinite be not lost from sight, the reasoning being like that concerning the line at infinity in projective geometry, then I see no objection to the method of limits except its unnecessary circumbendibus.

In the form which you would give to it, the error is not serious, but I do not think it is perfectly

demonstrative. To say that the error of a statement is less than any assignable magnitude is certainly not to say there is no error: Euclid himself would admit that.

You say, I give no adequate definition of what the method is. But the truth is you are mistaken as to what the method of limits is. It does not consist in reasoning in a special way, and were I to select two forms of the method as illustrations, thus greatly lengthening the definition, neither would be that which you wish me to give exclusively.

On the whole, I do not think your original judgment of the three definitions has been shown to be manifestly just.

Yours very faithfully
C. S. Peirce

Peirce refers constantly in his writings to the influence of Lobachewsky, Clifford, Cayley, Cantor, and Klein on the direction of his mathematical thought. Historically, the idea that our space might be non-Euclidean with a scientifically verifiable curvature had been developed along with the non-Euclidean geometries shortly before Peirce penned the next letters.[45] It is curious that he should in these letters cling to the theory of negative curvature when the computations gave him the "reverse of what" he wished, for he was an old hand at the theory and practice of testing scientific hypotheses. He was most certainly acquainted with Riemann's celebrated paper, which in Clifford's translation becomes, *On the Hypotheses which Lie at the Bases of Geometry*. Apparently the strong Lobachewskian influence, which is so evident in his mathematical manuscripts, prevailed at this time.

My dear Newcomb:

I want to get into circumstances in which I can pursue certain researches. I want you to do certain things to aid me, and to that end, I want you first to remark how encouraging the figures look in regard to my attempt to make out a negative curvature of space.

1.—The small number of negative parallaxes, considering the errors to which such work is subject, is an argument that their real values are not very small. I think infinitely distant stars may for aught we know have parallaxes of 0″.10.

2.—When we look at the numbers of stars of different magnitudes, we are struck first with the fact that they increase with the magnitude in a pretty regular way, and second that they do not increase nearly so fast as equable distribution requires, especially for the fainter stars.

Now the surface of a sphere (or the reciprocal of the light) is proportional to $[\sin h(r/2k)]^2$.

The volume of a sphere is proportional to $[\sin h(r/k) - (r/k)]$.

In the D M the number of stars of magnitude 4.8 and brighter is 468 = (2.670) of magnitude 8.8 and brighter is 70197 = (4.846)

This gives the ratio of increase per magnitude (0.544) instead of (0.600) according to the Euclidean Theory. I cannot now go further, as I want the latest photometric measures of DM stars.

3.—It is well-known that the proper motions of faint stars are not much smaller than those of brighter ones. Some years ago I compared the photometric measures of Seidel with Mädler's proper motions and found as follows

Mag	Distance from Proper Motion	Square Root Distance from Brightness
1	1.00	1.00
2	1.32	1.35
3	1.62	1.62
4	2.00	1.91
5	2.45	2.29
6	2.56	2.88

Now a proper motion has two parts, a parallactic part, inversely proportional to $\tan h(r/2k)$ and a stellar part, inversely proportional to $\sin h(r/2k)$. The component directed toward the apex of the sun's motion is in the mean entirely parallactic, the component perpendicular to that is entirely stellar. These two are in the mean not far from equal.

Hence, the total proper motion is in the mean proportional to

$$\sqrt{\frac{1}{\sin h^2(r/2k)} + \frac{A}{\tan h^2(r/2k)}}$$

where A is such that the terms are generally nearly equal. Now $\tan h(r/2k)$ is nearly constant for large values of r; so that this is not very remote from

$$\sqrt{\frac{1}{\sin h(r/2k)}}$$

[45] No date, Newcomb Collection, Library of Congress. The first page of a draft is in the Peirce Collection, Box VB2b, at Widener Library.

Dec. 21, 1891, Newcomb Collection, Library of Congress. (The number sheet mentioned is not in the folder in the files.)

Dec. 21, 1891, draft in Peirce Collection, Box VB2b, Widener Library.

Dec. 23, 1891, *ibid.*

No date, *ibid.*

The writer has found in the archives of the Smithsonian Institution a complete manuscript by Peirce entitled: On two map-projections of the Lobatschewskian plane. It reached Langley too late to be read at the Academy of Science meeting for which it had been intended.

To show this, the ratio of Distance from brightness to Distance from proper motion is (multiplied by a constant)

Mag	Observed Ratio	$\sqrt{1 + 2\cos h^2(r/2k)}$	Where $2k$ = Dist of 5th mag stars.
1	1.11		The reason I multiply $\cos h^2\,(r/2k)$ by 2 is to make the two terms about their actual relative values.
2	1.53	1.78	
3	1.80	1.85	
4	2.02	2.02	
5	2.38	2.40	
6	3.60	3.05	

There were only a few 6th magnitude stars in Seidel's list.

4.—But the question is whether the component of the proper motion perpendicular to the great circle from the star to the apex of the sun's motion really diminishes (as $r/2k$ increases) relatively to the component in the line to the apex.

According to preliminary tests it really does so. Thus, I take all the stars of your catalogue from $5^h\ 30^m$ to $6^h\ 30^m$ and assume the meridian through each star to be the line through the sun's apex (a rather violent assumption). There are 53 stars. Of these, 7 are moving *towards* the apex. These I reject and the 7 that are moving most rapidly *away* to balance the first. I then find for each star the ratio of motion in *arc* of a great circle perpendicular to the meridian to its motion in the meridian. I divide them in the stars brighter than 6 and fainter than 6 mag. The lists are nearly equal. From each list I reject 3 sporadic very high values of the ratio, and the three lowest values to balance them. For the rest I find the mean ratio 0.92 for the bright stars and 0.68 for the faint ones. The difference is, no doubt, excessive.

I try the same for 18^h. But here the stars do not happen to be so favorable. The same treatment gives

for 10 bright stars 1.12
for 6 faint stars 0.91

All these results are favorable to the hypothesis; and can only be otherwise explained by *four* different suppositions. The argument appears to me strong enough to call for the *closest examination*.

The hypothesis is capable of being tested in *many ways*. It seems to me that an exhaustive discussion of it is called for.

The discovery that space has a curvature would be more than a striking one; it would be epoch-making. It would do more than anything to break up the belief in the immutable character of mechanical law, and would thus lead to a conception of the universe in which mechanical law should not be the head and centre of the whole.

It would contribute to the improving respect paid to American science, were this made out here. I should like to have a whack at it myself; and as I have found out what I have, I think I am entitled to that whack.

A month or six weeks' work might show how the thing was promising. But to discuss the matter as it should be discussed, from six to nine months would not be too long. The question is, can some appropriation be made, or some millionaire be found, to pay $3000 for this, $2000 for six months of my work and $1000 for an assistant? Will you and other men, say Langley, King, Powell, Rood, John Fiske, be willing to express the opinion that it is a piece of work most desirable to have done?

In my mind, this is part of a general theory of the universe, of which I have traced many consequences, —some true and others undiscovered,—and of which many more can be deduced; and with one striking success, I trust there would be little difficulty in getting other deductions tested. It is certain that the theory if true is of great moment.

What interest would you take in the matter?

Very faithfully
C. S. Peirce

I wonder whether a professorship of logic in Stanford's University would be beyond hope for me.

My dear Newcomb:

Since writing you I have taken 63 faint stars from your catalogue and as near each as I could a bright one and for these have calculated the proper motions away from the apex and in the perpendicular direction. The result is most decidedly the reverse of what I wished; and this shows itself in several ways. I enclose some numbers.

My computations are without check; but errors to affect the result are impossible, I think. The apex was taken at $\alpha = 270°\ \delta = +30°$ for 1850.

Yours very faithfully,
C. S. Peirce

It still seems to me the subject should be pursued.
Milford Pa 1891 Dec. 21

Milford Pa 1891 Dec. 21

My dear Newcomb:

One thing is clear. It is that those figures I sent you lend no support whatever to the idea of a positive curvature, but are rather against it. The striking non decrement of the *peculiar motion* with the brightness needs to be investigated. But the formula for the surface of the sphere and for the peculiar motion equally involve $\sin h(r/2k)$ or $\sin(r/2k)$.

Very faithfully
C. S. Peirce

I have given a whole day to this. I cannot any longer afford the luxury of unremunerative work but very little.

Milford 1891 Dec. 23

My dear Newcomb:

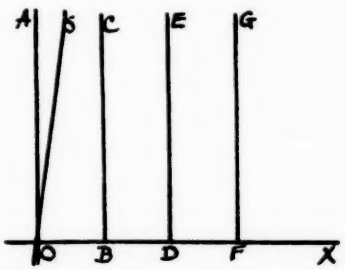
I have for the present given up the idea that anything can be concluded with considerable probability concerning the curvature of space. The best argument I could make was as follows. By *long* motion, I mean the component of proper motion directly away from the apex of the sun's motion. By *cross* motion the motion at right angles to that. Now I found the cross motion and brightness had remarkably little to do with one another. Separating the stars (I mean the 126 I wrote to you of) into two equal sets according to the magnitude of either of these quantities, I find the other quantity nearly equal for both sets. In point of fact, the intrinsically brighter stars have in the mean probably a greater mass and therefore by the law of action and reaction a smaller absolute motion. Consequently, I said, the geometric mean of the distance as deduced from the brightness and from the cross motion will probably be remarkably near the . . . .

incomplete

New York 7 West 43 St.

My dear Newcomb

The following question recently put to me seems to involve fundamental points relating to infinity. I should like to see how you would answer it.



Upon the straight line OX erect an infinite series of equidistant perpendiculars OA, BC, DE, FG, etc. and draw the oblique line OS. Then the space included between AOX and the circle at infinity bears some finite ratio to the space included in AOS and the circle at infinity. But it bears an infinite ratio to the space included between two successive perpendiculars, the base line, and the circle at infinity. Hence the diagonal OS must cross all the perpendiculars, contrary to Lobatchewsky. Where is the fallacy?

Yours very truly,
C. S. Peirce

Two of these letters from Peirce drew from Newcomb a reply[46] which, in its discussion of the possible curvature of space, anticipates the subject of his Presidential address before the American Mathematical Society on December 29, 1897.[47] That address was entitled "The Philosophy of Hyper-Space." Although it cannot be reproduced *in toto* here, a few excerpts will serve to clarify Newcomb's position and to highlight his scientific conservatism in refusing to entertain a hypothesis which had not yet come completely unscathed through the acid test of experiment.

His address reads, in part,

I cannot but fear that some confusion on this subject is caused by the tendency among both geometers and psychologists to talk of space as an entity in itself. . . . For us the limits of space are simply the limits to which we can suppose a body to move. Hence when space itself is spoken of as having possible curvatures, hills and hollows, it seems to me that this should be regarded only as a curvature, if I may use the term, of the laws of position of material bodies in space. Clifford has set forth, with acuteness and great plausibility, that the minute spaces occupied by the ultimate atoms of matter may, in this respect, have properties different from the larger space which alone makes itself known to our conceptions. If so, we should only regard this as expressive of some different law of motion, or, since motion is only a change of position, of some different law of position among the molecules of bodies.

Newcomb continues with the observation that "This consideration leads us to a possible form of space relations distinct from those of our Euclidean geometry, and from the hypothesis of space of more than three dimensions. I refer to what is commonly known as 'curved space.'" He speaks of the two independent substitutes which had now been made for the Euclidean axiom and the need of testing any curved space hypothesis by experience, and of the narrow limits of the two extremes of the earth's orbit within which "the measures of stellar parallax give no indication that the sum of the angles of a triangle in stellar space differs from two right angles." Moreover, he adds,

The wise man is one who admits an infinity of possibilities outside the range of his experience, but

[46] *Ibid.*

[47] *Science*, n.s., **7**: 1–7, Jan. 7, 1898. See also address delivered at meeting of the N. Y. Math. Society, Dec. 28, 1893, (*N. Y. Math. Soc. Bull.*, 95–107), entitled: Modern mathematical thought.

who in considering actualities is not decoyed by the temptation to strain the facts of experience in order to make them accord with glittering possibilities. . . . We are justified by experience in saying that the space relations which we gather from observation around us are valid for the greatest distances which separate us from the most distant stars. We have no right to extend the conclusion further than this. We must leave it to our posterity to determine whether, in either way, the hypothesis of hyperspace can be used as an explanation of observed phenomena.

Newcomb's reply to Peirce now follows.

Nautical Almanac Office

Bureau of Equipment and Recruiting
Navy Department
Washington Dec. 24, 1891.

My dear Peirce:

I received your two letters, each in due time, but am so crowded with work that I cannot give the subject the study which it deserves. I can therefore only refer to the different points in a general way.

First, does not the fact that all recent determinations of parallax are relative, prevent us drawing any conclusion as to a limit of ultimate parallax? It seems to me it does. That is to say the relative parallaxes of distant stars will converge towards zero on either hypothesis.

Second, in drawing conclusions from statistics of stellar magnitudes, the number of disposable hypotheses seems to me so great that we can scarcely test them even on the supposition of homaloidal space; much less, then, can we draw a conclusion as to the curvature of space. The fact is, it seems to me doubtful whether we can derive any law of relation between an absolute magnitude of a star and the number of stars having that magnitude.

Third, the proposition that the proper motions of faint stars are not much smaller than those of bright ones, seems to me not established, except in this sense; that, given a proper motion of two or three seconds or more in a century, the number of stars having it range through a wide degree of brightness. But you would thus exhaust the bright stars much quicker than you would the faint ones.

As to getting a grant of money for the purpose you mention, it seems to me the difficulties are insuperable. In the first place, the task of getting the scientific world to accept any proof now possible that space is not homoloidal, is hopeless, and you could have no other satisfaction than that of doing a work for posterity. In the next place, it is, I believe, unusual if not unprecedented, to pay an investigator to do a work of his own out of trust funds for the advancement of science, at least among us. I do not know where to look for funds to do this with.

As for the Stanford University, I have never been in any way consulted respecting it, and in fact know nothing about it, except what I have seen in print. I do not therefore feel able to do anything in that direction.

Yours very truly,
Simon Newcomb

Prof. Chas. S. Peirce
Milford
Penna.

Newcomb's extreme conservatism with regard to mathematical matters in the first of the following letters[48] is very surprising. Peirce was, without doubt, the more daring intellectual of the two. For example, he later corresponded enthusiastically with Langley on the development of the aeroplane[49] while Newcomb believed not at all in its potential, practical value.

Discussing the power of the "infinitesimal" approach to the calculus[50] Peirce gives an illustration from the work of Fermat,[51] and concludes with the sentence, "The method of indivisibles had recognized that infinitely large numbers may have definite ratios, so that the division is applicable to them." In a footnote to this sentence, Peirce remarks that "Newcomb errs in saying (Johnson's *Cyclopedia*, 1894, IV, 576) this method is 'medieval,' and his description of it is not very characteristic. He is also wrong (Funk's *Dictionary, indivisible*) in calling it an application of the method of limits."

The second and third letters[52] are self-explanatory.

Nautical Almanac Office
Navy Dept.—Wash. D. C.
Mar. 9th. 1892

My dear Peirce:

Your last letter seems decisive in favor of a proposition which I have often been inclined to maintain, to wit, that all philosophical and logical discussion is useless. If there is any one question which illustrates the correctness of the doctrine of infinities, always maintained by me, it is the very one suggested by the demonstration you and Halstead sent me. I have always held that infinity,

[48] Peirce Collection, Widener Library. Box V B2b.

[49] Peirce-Langley Correspondence at the Smithsonian Institution.

[50] *The collected papers of Charles S. Peirce*, 4.151.

[51] Peirce could have referred to his father's approach to the derivative in B. Peirce's book entitled *An elementary treatise on curves, functions and forces.*

[52] Peirce Collection. Widener Library. Box VB2b.

considered in itself, could not be treated as a mathematical quantity, and that it is pure nonsense to talk about one infinity being greater or less than another. The ground for this view I think I mentioned in our correspondence a year ago; the very meaning of the word infinity is something without bounds. But we can compare two magnitudes only by comparing their bounds. Therefore I say the reasoning in question is baseless. What more can I say?

Yours very truly,
S. Newcomb

Mr. Charles S. Peirce
The Century Club
New York, N. Y.

Washington, D. C.
April 23, 1895

My dear Peirce:

I was puzzled by something in the Century Dictionary, which can, I think, be explained by no one but yourself. I refer to the definition of an oddly odd number. As no odd number can have any except odd factors, I do not see what the definition amounts to. It is I know a very old one, but did it originate in anything but a blunder of some ancient editor?

Yours very sincerely
S. Newcomb

Mr. Charles S. Peirce

Nautical Almanac Office,
Navy Department
Washington May 11, 1895.

My dear Peirce:

The enclosed paper has been offered to the Amer. Journal of Math. Before deciding what to do with it I would be much pleased to have you examine it, and point out any unsoundness that you may find. I have not yet looked at it carefully, as I can better do so after having your examination of the subject before me.

You may address your remarks to Dr. Craig, who is now responsible editor, especially as I may be away when they arrive.

Yours very truly,
S. Newcomb

Professor C. S. Peirce
Milford, Pa.

Thanks for your reply to
my question about "oddly odd."

The mathematical content of a number of the letters already quoted reflects Peirce's need for tenacity in the pursuit of a clarification of the meaning of each term. For the mathematical concepts of infinity, continuity, and probability as well, were to be found among the deepest foundation stones of his system of philosophy.

During the period in which the next letter[53] was penned, Peirce was preparing the lectures on the history of science which he delivered at the Lowell Institute that year. His familiarity with the old star names was to be expected after his notable work two decades earlier in the preparation of the historical portions of the *Photometric Researches*.

Milford Pa. 1892 July 28

Simon Newcomb LL.D.
Sup't. Nautical Almanac
Dear Sir:

In observing for time, I find the old star-names, where they exist more convenient than Bayer's designations. No doubt, many other observers would be of my mind. I suggest these names be inserted in the Almanac list, or at least, the following of them.

α Andromedae	Alpheratz
β Cassiepeae	Chaaph
α "	Shedir
β Ceti	Diphda
β Andromedae	Mirach

I do not think the second word in the name of a constellation should begin with a capital.

Yours respectfully
C. S. Peirce

(Only five of the ninety-eight names given by Peirce are listed here)

Without academic or government affiliation after 1891, Peirce decided to bring his materials together for publication in a set of twelve volumes to be entitled "The Principles of Philosophy: Or, Logic, Physics, and Psychics, considered as a unity, in the Light of the Nineteenth Century." A prospectus[54] was prepared by Peirce and subscriptions at two dollars and fifty cents per volume were solicited in advance. Peirce's synopsis reads as follows:

Vol. I—Review of the Leading Ideas of the Nineteenth Century.
Vol. II–The Theory of Demonstrative Reasoning.
Vol. III—The Philosophy of Probability.
Vol. IV—Plato's World: An Elucidation of the Ideas of Modern Mathematics.
Vol. V—Scientific Metaphysics.

[53] Peirce Collection. Widener Library. Draft. Box VB2b.

[54] There is an extant copy of the synopsis in the Harvard University Archives section of the Widener Memorial building. The writer is indebted to Mr. Robert Haynes, Assistant Librarian, for securing permission to publish it.

Vol. VI—Soul and Body.
Vol. VII—Evolutionary Chemistry. (The title may probably be changed.)
Vol. VIII—Continuity in the Psychical and Moral Sciences.
Vol. IX—Studies in Comparative Biography.
Vol. X—The Regeneration of the Church.
Vol. XI—A Philosophical Encyclopedia.
Vol. XII—*Index* raisonné of *Ideas and Words*.

Peirce could not find a publisher to support the project. Henry Holt rejected it in a letter dated December 2, 1893.[55]

In the letter[55a] to Peirce about the proposed volumes, Newcomb's remark about "inverse probability" is surprising since he had written papers on the theory of probabilities for Runkle's *Mathematical Monthly* in the period 1859–1861.

Washington D. C.
Jan. 3rd, 1894

Dear Sir:

I am persuaded that whatever you might write on the subject of scientific philosophy would be provocative of thought and discussion, and therefore interesting, whether one accepted your conclusions or not. You may therefore put me down as a subscriber to your proposed volumes.

Your 2nd, 3rd, and 4th vols. are those which I should think would have the most scientific value, and which I would therefore rather see come out first.

I am curious to know what the doctrine of inverse probabilities is, as I see you propose to refute it.

I am sorry to see that you repeat the implication that somebody holds the dogma that we cannot reason mathematically about infinity. That we cannot correctly reason about infinity as if it were a magnitude is a proposition which I think no one ought to dispute; but if you do dispute it, I am sure you, as a logician, ought to put the proposition into the shape in which your opponents uphold it.

I am sorry to say that you greatly overestimate the value of any expression from me on your subject. My experience leads me to believe that people have very little confidence in my views on subjects outside of mathematics and astronomy. The general subject of the greater number of your volumes is one on which people already have their minds made up.

I could make a number of criticisms both on the expressions in your circular, and the descriptions of your volumes, but as it seems to be printed in its final form it is not worth while to do so.

Yours very sincerely,
S. Newcomb.

Mr. C. S. Peirce
Milford
Penna

The Thomas Bayes mentioned in the first of the next two letters[56] developed a basic theorem in the subject of inverse probabilities which was published posthumously in the *London Philosophical Transactions*, vols. 53 and 54 for the years 1763 and 1764. According to R. A. Fischer,[57] Bayes was the first to use mathematical probability inductively, "that is, for arguing from the particular to the general, or from the sample to the population." With his abiding interest in all possible forms of logical inference and his own logic grounded in the trilogy of inductive, deductive, and abductive inference, Peirce would of necessity be deeply concerned with the validity of conclusions so drawn.

Washington, D. C.
January 16, 1894.

My dear Peirce:

There seems no immediate occasion for me to do more than merely acknowledge yours of Jan. 6. I quite coincide with your expression of the spirit in which you treat the subject, although I fear my philosophy would diverge a good deal from yours. Your prospectus is well fitted to excite curiosity, and yet I fancy that the last paragraph, and possibly several of the preceding paragraphs, will not attract an audience. I do not mean by this to imply that there is anything objectionable or open to criticism in the paragraphs above referred to. But experience has taught me that there are some subjects on which nobody wants to be really informed.

As I do not know exactly what Bayes' theorem is, I am still in the dark as to your objection to inverse probabilities.

In your letter you say, "You begin by finding fault with a sentence quoted verbatim from yourself." I am curious to know what that sentence is, and where it was uttered.

Yours very truly,
Simon Newcomb

Mr. C. S. Peirce
Milford, Penna

Washington, D. C.
February 7, 1894.

My dear Peirce:—

Excuse my inattention to your letters. I am overrun with work, the result of having ten years' computations of about six or eight computors to get

[55] Peirce Collection. Publishers' Correspondence. Widener Library.
[55a] Peirce Collection. Widener Library. Box VB2b.
[56] Peirce Collection. Widener Library. Box V B2b.
[57] *Statistical methods for research workers*, Edinburgh, 1938. Also E. T. Bell, *Development of mathematics*.

into shape and weave in with astronomical theory. But for this you would find me paying much more attention to your projects.

I am greatly obliged for your explanation about the inverse probabilities. The problem you allude to is of course one in which an element is lacking. But your programme gave the idea that you meant to subvert one of the best grounded theories of mathematics.

Your second letter puzzles me. In the first place if you do not agree to my conclusions by all means say so in the plainest English you can use. I would a good deal rather be killed by a rattling attack than "todgeschweigen," as the Germans say. But I am utterly unconscious of having said that there has been no great advance in mathematics since Euler and La Grange. On the contrary I thought my whole address was devoted to showing the spirit of that advance.

Yours very truly,
S. Newcomb.

One of Peirce's meager sources of income during these years was as a reviewer of books for Garrison's *Nation*. The passage in the review referred to in the next letter[58] is the opening paragraph which reads as follows:

Many good people fancy that the advances of mathematics, like those of jurisprudence, become manifest only when the state of things in one generation is compared with that in another; and that they are merely in the nature of extensions of old methods to new cases. . . . We are speaking of pure mathematics, not celestial mechanics.

Dear Newcomb,

Some months ago I wrote for the *Nation* a notice of some books on the Theory of Functions. The *Nation* is not exactly ravenously hungry for that sort of thing and the proofs only reached me this week. I then saw that you might fancy I meant to attack your address, which of course I had not seen when I wrote what I did. I added a sentence to soften the contradiction. But really I think you are wrong. You might as well say that Chemistry has made no progress since Geber; because we can no more transmute the metals now than we could then.

You must take mathematics to mean pure mathematics and conceive its problems as they are conceived today. On that point of view, the advance of mathematics seems to me wonderfully rapid and accelerating.

However, my purpose is not to *tackle* you but only to explain that what may look like a reply to you was really written long before your address.

Very truly
C. S. Peirce

Their overlap in interests would account for many of the mutual scientific associations of Peirce and Newcomb. Among the most eminent of these was the British astronomer Sir Joseph Norman Lockyer. He had headed the British Eclipse Expedition to the Mediterranean in 1870 and was closely associated with the American team in Sicily. Peirce's first wife, Melusina Fay, was a working member of the American group and in her official report to the Coast Survey she refers to Lockyer's general helpfulness.[59]

Peirce himself often expressed his great respect for Lockyer's work and the quality of his reasoning. In later years he reviewed *Lockyer's Inorganic Evolution as Studied by Spectrum Analysis* and paid him the following tribute[60] at that time. He said,

That the relations among the chemical elements are to be explained by some sort of evolutionary process is the only idea we can at present entertain. We ought to begin then, with trying how the hypothesis of the simplest kind of evolution that could answer the purpose will fit the facts, and adhere to that until it is refuted. Lockyer's seems to be that simplest hypothesis. . . .

In the Newcomb letter[61] which follows, Peirce's approach to many of the problems in the history of science stands revealed. Using the tools of the modern astronomer he checked mathematically the assumptions on which Lockyer had based his historical theories in the *Dawn of Astronomy*. Peirce's review[62] was based on these computations and exposed Lockyer's incompetence in this field. He questioned Lockyer's claim that "Egyptian temples were generally oriented to the risings and settings of stars." Some of the argument against the hypothesis is given in the second letter[63] following.

[58] Newcomb Collection. Library of Congress. The books reviewed were *Theory of functions of a complex variable* by Forsyth; *A treatise on the theory of functions* by Harkness and Morley; and *Traité d'analyse* by E. Picard, *The Nation* **58** (1498): 197, Mar. 15, 1894.

[59] *U. S. Coast and Survey expedition to the Mediterranean for observing the eclipse of 1870.* Appendix No. 16 of U. S. C. S. Report for 1870 (Dec. 22, 1870).

[60] *The Nation* **70** (1819), May 10, 1900.

[61] Peirce Collection. Widener Library. Box V B26.

[62] *The Nation* **58** (1500): 234, March 29, 1894.

[63] Newcomb Collection, Library of Congress. Peirce's approach to problems in the history of science was emphasized by the writer in a paper which will appear in the *Proceedings* of the Eighth International Congress for the History of Science held at Florence, Italy, September,

Nautical Almanac Office, Naval OB
Georgetown Heights, D. C. Feb 13, 1894

Dear Mr. Peirce:

Mr. Garrison desires me to send you certain data respecting the obliquity of the ecliptic and the positions of the fixed stars for epochs of ten thousand years back, which will be within a few minutes of arc. I do not know of any formulae which will in themselves serve your purpose. Of course the ordinary formulae for precession do not apply, and the data for the rigorous trigonometric reduction have not, so far as I am aware, ever been carefully computed. So the best I can do is to send you the data for making the computation.

Having the path of the pole of the ecliptic during the past 10000 years, as shown by the numbers on the diagram, the motion of the pole of the earth can be computed by mechanical quadratures, within one or two minutes of arc. It would seem from the diagram that the obliquity has been diminishing during almost the entire period, or, more exactly, about eight thousand years, so that it was probably nearly one degree greater ten thousand years ago than it is now. With the former position of the pole the places of the stars can be computed by the trigonometric reduction.

I am very glad you are ready to take up that book of Lockyer's. If he has really produced a sound scientific work, by all means let Sir Joseph have the credit of it. But if it is of a piece with much of his other work, let him be shown up.

Yours very sincerely,
S. Newcomb

Peirce
Milford Penna

Milford Pa 1894 Feb. 20

My dear Newcomb:

I enclose you a circular showing what use I am putting your letter to.

In regard to Lockyer's Theory, I think, in view of its *possible* importance if true, in setting early Egyptian chronology, which I think has a bearing on our whole conception of man's development, that he has made out sufficient case to warrant the expenditure of time and money to collect further facts. At the same time, I think there is much against the theory.

As for the circular zodiac of Denderat, it is possible to locate upon it with some probable accuracy,—aside from any *measurements* made upon it,—the positions of about 40 stars. Then measuring the places of those stars, we find they agree in R. A. with a polar projection made about 700 B. C. and then *radii vectores* will not suit any projection I can think of but one from the vertex of the cone tangent to the sphere on the circle of perpetual occultation at 35° to 40°. Nothing in Egypt will answer at all. Now 719 B. C. Egypt was defeated in a great battle by Sargon whose capital was Nineveh, lat 36°, and about that time Assyria began to be more influential intellectually in Egypt. I am therefore inclined strongly to think that the original from which after many copies and changes this "zodiac," or rather planisphere was taken was made on such a projection (or some projection practically equivalent) at Nineveh about that time. For if made in Egypt how could it fail to show Canopus, and in short all stars, (but one, apparently) of lower declination than −48° which at Denderat have an altitude at culmination of 16°? Now since the planisphere was put up about A. D. 14, it follows that the Egyptians had made no observations of the stars to speak of for 700 years; and that quite accords with my opinion of their scientific nullity. The idea of expecting to find such a people orienting their temples with any sufficient accuracy to settle chronology, I think is difficult. Doubtless if we could find temples of the pyramid epoch, or thereabout, that could be shown by independent evidence to be oriented to stars, then the case might be very different. Perhaps Lockyer may do so in the future. I should be glad to see him go to work. So far his evidence is slender.

Very truly
C. S. Peirce

Peirce made a last great effort in 1899 to return to the Coast Survey as Inspector, Bureau of Weights and Measures. His earlier Coast Survey work had given him a particular competence for this position as the first of the next two letters[64] shows. He was not successful, however, in his quest for the job. Among his sponsors were Asaph Hall, Seth Chandler, and George A. Plimpton. The second letter[65] was apparently written by Newcomb while on one of his favorite walking trips in Switzerland.

Milford Pa 1899 June 10

My dear Newcomb:

I am an applicant for Civil Service Examination for the place of "Inspector of Standards," Office of Weights and Measures, U.S.C. and G. Survey. Salary $3000, the same I formerly had. When I shall have been accepted as a candidate for examination, the first question put to me, I am informed, will be, Name five persons who will answer questions concerning your "scientific administrative qualifica-

1956. A more general statement about his activities in that area was made in a report on his work which appeared in *Year Book Amer. Philos. Soc.* for 1954: 353–358, 1955.

[64] *Ibid.*

[65] Peirce Collection. Widener Archives. Box V b5.

tions and experience." I naturally apply to my colleagues on the Academy Committee on Weights and Measures of which you are a member.

Allow me to remind you that you have known about the following work of mine pertinent to the question:

1st, that in 1874 I first undertook to "weigh the earth" by setting up a balance over a deep shaft and comparing the weight of 10 kilos above and below. I did not succeed because I could only work when the machinery at the Hoosac tunnel was stopped and that could only be stopped for two hours on successive Sundays. Now there were difficulties about oscillations of the wire and about moisture which could not be overcome in that short time. But the method, which I first proposed, was soon after applied successfully by others.
2nd, that my determinations of the absolute value of gravity were superior to those which immediately preceded them; if not to all previous ones.
3rd, that that work involved my bringing to America the first authoritative line-metre.
4th, that my work of comparing the length of a bar with the mean ruling of a glitter-plate, with a view to obtaining a check on secular changes in the lengths of bars, had many merits. My measurements of the deviation of the ray were more accurate perhaps than any measurements of a large angle ever made. The peculiar comparator I invented and used enabled me to build up from a double centimeter with a probable error of less than a millionth part, which was quite a feat. True, Rowland found a break in my glitter which vitiated my value of the wave length of light. But that does not, I believe, affect my *main purpose*, as long as that plate can be used again.
5th, that I proposed and used the method of two reversible pendulums in order to compare the lengths of the yard and the metre, a new idea.
6th, that I was for some months in charge of the Office of Weights and Measures under Hilgard as Superintendent; and only left because his physical condition was such as to cause me embarrassment which I thought required me to quit Washington.

May I name you as one of the five persons who will answer questions as desired, and may I hope that those answers will be favorable?

Yours very truly
C. S. Peirce

Maloja, Switzerland
July 21, 1899

My dear Peirce:

When your letter of June 10 reached me I was at a mountain recess where correspondence was very difficult. So I have postponed answering it and other letters till I could settle down.

I do not see how I could say anything of real value about your "scientific administrative qualifications & experience." Your work was done for the Coast Survey and its records are there, and tell their own story. The Superintendent has at his command all the data for reaching a conclusion and nothing that I could say could add to his knowledge of the subject. It is very clear to me that the persons to whom the C. C. Comm. should apply are those who have made a more careful study than I have of your work or have had occasion to examine it. These are but to be found among the C. S. and other pendulum experts.

Sincerely yours,
S. Newcomb

Early in 1904, Garrison[66] requested Peirce to give priority in the selection of his reviewing assignments to Newcomb's *Reminiscences of an Astronomer*. Peirce's review[67] was highly complimentary to Newcomb as a person and as a scientist. Garrison observed in a letter to Peirce dated March 10, 1904, that it would please Newcomb.

Apparently Peirce had included in the original version of the review an extended description of the succession to the seat to which Newcomb had been elected in the French Academy of Sciences in 1895.[68] The next letter[69] reveals one possible source of Peirce's information regarding it. Since the original review was too long, Garrison deleted the discussion of the succession and, at Peirce's suggestion, submitted it to the *Evening Post*. The *Post* printed that part of the "disembowelled Newcomb" as the leading article in the Saturday Supplement on March 5 of the same year.

Peirce called the article "French Academy of Sciences" and in it he traced the history of the eight seats of the *associés étrangers* created in 1699. Since five of these places had not existed previously, they were filled at the time by the election of Hartsoeker, Newton, Jacob and John Bernoulli, and Viviani, all more or less mathematicians. Peirce mentions the fact that Franklin, Rumford, and Newcomb were the only Americans honored by election and then, man by man, shows the succession of Newcomb to New-

[66] *Ibid.* Garrison file of letters. Jan. 8.
[67] *The Nation* **78** (2021): 237, March 24, 1904.
[68] Peirce knew something about the Academy at first hand. He had lectured there on June 14, 1880 on the value of gravity.
[69] Newcomb Collection. Library of Congress.

ton's seat. Indeed, this must have pleased Newcomb very much.

Milford Pa 1904 Jan. 15.

My dear Newcomb:

Living here so far away from libraries, when I do not know what book to borrow in order to get a given piece of information, I have to ask the good offices of some person up in the subject.

Now when you received the extraordinary honor of election as Foreign Associate of the French Academy of Sciences, I think you must have had the curiosity to know, 1st, when the rule that there should be five was made and what previous number there had been, if any; and the whole history of the institution of five members. 2nd, I would like to see the complete list of all there ever have been down to today. 3rd any curious anecdotes connected with the matter.

I remember a book by one of the de Candolles which I think gave the names of most of them. But I may be mistaken and at any rate the book is thirty years old.

If you know of such a book, I wish you would kindly write to Dr. Herbert Putnam and tell him that is the book I am after. I will write to him that I would like him to send me De Candolle[']s book and also a book or book[s] for the title or titles of which I have asked you to send to him. Then you will have no responsibility in the matter but will merely furnish a piece of information to me to whom everything relating to the history of science is interesting.

I enclose some pages of a Syllabus that may possibly interest you. It certainly would had I been able to print the whole. But though I limited the copies to 100, the money gave out when the printer got so far. The whole would have been about a hundred and fifty such pages. Logic is a subject which does not amount to a row of pins unless it is treated systematically and it is necessary to push through a mass of stuff like the greater part of what I send and then through matter of extreme subtlety and difficulty of comprehension of another kind, in the way of logical analysis, before one can treat in a solid way of the part of the matter that is generally interesting. I have a great quantity ready for the press which I think, more keenly the more experience I gain, is of really great importance. But there is no hope of its ever being printed. It seems a fearful piece of egotism to study so deeply for myself alone. But it is not my fault.

Very truly
C. S. Peirce

Among the computers on Newcomb's staff in the Nautical Almanac Office, none was so highly prized by Newcomb as the mathematician G. W. Hill. Newcomb praised his work on every possible occasion and paid particular tribute to him in his *Reminiscences of an Astronomer*[70] with a statement opening with the words, "Perhaps the most eminent and interesting man associated with me during this period was Mr. George W. Hill, who will easily rank as the greatest master of mathematical astronomy during the last quarter of the nineteenth century."

Peirce wrote a note on "Mr. G. W. Hill's Moon Theory" in the *Nation*[71] on October 19, 1905. He lauded Hill's achievements in celestial mechanics. He speaks of Hill's "staggering conception of an infinite determinant" and of his success in "virtually solving a differential equation of an infinite order." In doing so Hill probably did not "perceive that he was applying Baconian reasoning to mathematics." Peirce speaks of Vol. I of the *Collected Mathematical Works of George William Hill* as bringing the "oldtime glow of exultant American feeling."

By October 17, 1907, in a review[72] of Vol. IV of the *Collected Works*, Peirce speaks less glowingly of Hill's work and begins the second paragraph with the statement that

> This science . . . is reduced to an art of performing excessively intricate calculations. It must be a peculiar mind that can devote a lifetime to it; and with less devotion there is no chance of being able to improve it.

This review brought a fiery retort from Newcomb in a letter written on October 17 to the Editor of the *Nation* and which appeared in the issue of October 31, 1907.[73] Newcomb goes on to say,

> Now if you will slightly change your wording, and say that through the labors of a series of investigators from the time of Newton to that of Hill the theory in question is being reduced to an art of performing intricate calculations, you will hit the truth. What gives significance to the work of Hill and those in the same field is not their patience in performing calculations, but their ability to show how it is possible, by calculations within the power of one man, to reach results which would have required the labor of many lives if the methods had not been invented. Any good computer, under capable supervision, can make the intricate calculations. It is the method that costs.

[70] Pp. 218–223.
[71] **81** (2103): 321.
[72] **85** (2207): 355.
[73] **85** (2209): 396.

Appended to the above is a note which reads as follows:

By calculations, we did not mean numerical computations. Professor Newcomb expresses, as his own dictum, what we intended to say. We have already done justice to Dr. Hill's mathematical invention; but there is little of that in the fourth volume, which we have had under examination.

The Reviewer.

The following letter[74] needs no further comment.

P. O. Milford Pa. 1907 Oct. 31

My dear Newcomb:

The *Nation*, which comes to me today, brings to my mind your anger at my notice of the fourth volume of Hill's works. I am sure I like you no less for being angered and think it very natural. At the same time,—well, it is the facts of the situation and my stating those facts which irritate you. You cannot put your finger upon anything I said that is not perfectly true, and this is shown by your saying that *if* I *had* said so and so, I should have been right. Now that is just what I did say in substance. That the science of celestial mechanics by its own perfectionment is now reduced to calculation. Of course, I did not mean numerical computation, but just that sort of art that there is in Delaunay's method. It is not a method for finding out any substantially new truth, but is a method for calculating a result according to well known principles.

I never cast any slur on the men who do this sort of thing. I said they must have peculiar minds; but in some measure, this is true of any specialist. That you and Hill and other theoretical astronomers find in the afternoon of life that their own successes have rendered their science uninteresting to most people,—even to most mathematicians is distressing; but it is a fact. Meantime, for those who keep on I for one have an especial admiration, and the less interesting from any broad standpoint their work has been rendered, the more they deserve to be applauded; especially, since there is ground for hope that something important may eventually come of the work.

In short, if you will reread what I said coolly, you will see, that I was neither mistaken nor was I wanting in esteem for the theoretical astronomers, and that that which my article contained that was disagreeable was due to my expressing truths that may be unpleasant to a man like you, but are truths just the same for all that.

In short you read into my article a *tone* which really was not there. Your position is such that men do not like to tell you to your face that you are wrong. I don't like to do so myself; though it is not because offending you would inconvenience me otherwise than by sadness. You may be sure that nobody outside your group entertains a greater intelligent admiration for Hill and you than I do.

C. S. Peirce

The last letter[75] in this collection emphasizes the psychological as well as the optical factors of which the astronomer must be cognizant when drawing conclusions from telescopic observations. The problem is as old as the telescope itself and became a major issue in the controversies following the work of Lowell[76] and of Schiaparelli on the canals of Mars.

Newcomb expressed his opinion[77] that, despite Lowell's investigations of these basic factors as they related to his researches on Mars, further research was necessary. He mentions especially the "psychology of vision, that branch of the subject which relates to accuracy of conception and estimate" and which is "an almost virgin field." Newcomb had devised certain experiments on visibility and visual interpretation which, in their approach to the problem, were quite different from those of Lowell. He did not question the subjective reality of the canal system but he felt that the proof of its objective reality would be incomplete until further research on the process of visual inference had been made.

These remarks were refuted point by point by Lowell in a later issue of the journal[78] which had publicized Newcomb's criticisms. Lowell refers to the results of investigations made by H. Dennis Taylor which were "entirely opposite in conclusion from what is supposed to exist by Professor Newcomb." He points to Newcomb's use of transmitted light rather than reflected light in his experiments and holds rigidly to his own original position.

A one-page "Note on Preceding Paper"[79] by Newcomb follows the Lowell article, and a one-page "Reply to Professor Newcomb's Note,"[80] gives Lowell the last thrust in this joust.

In the letter which follows, Peirce refers to the results of the psychological experiments he performed in collaboration with J. Jastrow and

[74] Newcomb Collection. Library of Congress.

[75] *Ibid.*

[76] Mars and its canals by Lowell, *Annals of the Lowell Observatory* **3**: 268–277.

[77] *Astrophysical Journal* **26** (1): 1–17, July, 1907.

[78] *Ibid.* **26** (3): 131–141, Oct., 1907.

[79] *Ibid.* **26** (3): 141, Oct., 1907.

[80] *Ibid.* **26** (3): 142, Oct., 1907.

which he reported in a paper entitled "On Small Differences in Sensation."[81]

P. O. Milford Pa 1908 Jan. 7

My dear Newcomb:

Needless to say that I have read your paper on the canals of Mars with great interest. For though I have always thought that granting the reality of what Lowell has observed it is far from proving the work of intelligent inhabitants, yet I have worked enough with a longish equatorial, that of Cambridge, for near 3 years constantly, and have worked on stellar photometry still more, and on other photometry and chromatics very much more and on allied psychological problems to have great interest in anything such a man as you puts forward on the subject.

I have no doubt that the utterance of these words of caution from a man of such authority will do good to Lowell himself, not to speak of such men as Morse and Story who on the basis of no more than a few weeks in Lowell's observatory, put forward opinions and arguments of no weight at all. Yet I do not think your investigation is up to your standard; and I will mention one or two points which seem to me weak, besides the general objection that it is all too narrow and does not bring light upon the psychological laws involved.

In the first place I note that you accept as *established* the dictum of Gustav Theodor Fechner that the least sensible ratio of light is 101/100. If you will look in volume III Mem. of the U. S. Nat. Acad. of Sci. you will find a paper by me and my then student in logic Joseph Jastrow devoted to the question whether there is or is not such a thing as a "Differenz-Schwelle" or least perceptible difference of sensation; and of course, our conclusions being negative, can only be founded on that weakest form of induction, which consists in inferring that a given phenomenon does not exist because it has not appeared in a certain run of experience,—a form of inference that though *per se* very weak we are obliged to resort to in almost or quite every science. One does not believe in ghosts, or in meteorites, because critical investigation has never found them.

Now you know that I am *au fait* at experimental psychology; and I have not an exalted opinion of psychologists as scientific observers. Jastrow and I began with sensations of pressure and for a reason I will shortly mention we ended there. At once, using such precautions as any astronomer would use in observing faint nebulas, without any practice we found that if there were any least perceptible ratio of pressure, it was twenty or thirty times nearer unity than the psychologists had made it to be. We afterward tried to do the same thing for light; but were stopped by the utter impossibility of getting a piece of Bristol board containing a square inch of uniform luminosity. No doubt this might have been overcome. But Jastrow and I were severally pressed with other work and we dropped the investigation—contenting ourselves with what we had done. I hope you will scrutinize the tables of comparisons and the precautions which were more careful and studied and elaborate than the memoir states.

I became perfectly satisfied by the run of the curve that it is merely a question of a sufficient *molition* (my term for a volition prescinded from all purposiveness) of direct attention, voluntary or *involuntary*, to enable a person to perceive the difference between any two feelings, or sensations, of different intensities or of different energies of excitation under the same internal conditions. Our tables will enable you to form your own opinion as to this. But whatever conclusion you come to, let me tell you that Jastrow without any previous training except about two months experimentation with me upon pressure sensations, as soon as he took up photometry got as his average perceptible ratio of luminosity (with no great exertion of attention, though not in the fashion of the psychologist,) about 301/300 as well as I remember now. Certainly far less than had been said. Now if this principle,—a very broad psychological principle it is, with a thousand important consequences,—be correct, there is a fundamental weakness in your work in that you give the reader no assurance that you were worked up to the pitch of attention that Lowell and his assistants without doubt have been.

Another small criticism, pointing the opposite way is that you admit without qualification that some canals there are; and for no better reason than that they have been photographed. But what proof is there that the leading causes of illusion in telescopic observation are absent in examining the doubtless nearly invisible lines on the photograph?

In the present indispensableness of large expenditures for astronomy we ought to give a little extra praise, to be understood as a tactful recognition of the force of *character* involved in the conquest of *needles'-eye* difficulty, to the work of a young man of great wealth who shows a real devotion to the science, beyond what we should to the young fellow who is presumably working for an assistant-professorship in some college; and we cannot help admiring Lowell's work. He and all should be made to feel that it is bound to advance astronomy and *all science* not a little, whether his observations turn out to be observations of the real Mars, or whether they turn out to be observations of illusions partly based on instrumental imperfections; in the former case infusing into human veins a new motive for pursuing astronomical study, and in the latter case enforcing the lesson that *percepts* are not by any means as Karl Pearson calls them, the "first impressions of sense," but are

[81] *National Academy of Science Memoirs* **3**: 75–83. Read on Oct. 17, 1884.

results of "Schluss-Verfahrungen" of our deeper lying consciousness, closely and in much detail, analogous to the different varieties of critical induction, yet having certain general characters of their own, which must be brought to light before we can make the best use of the finer kinds of observations.

I confess that your reasoning about the visibility of a line appears to me to involve a momentary forgetfulness of the fact that not merely what we call "illusions," that is, perceptual inferences that are refuted by others, but also *all* results of perception, have processes behind them which have all the characters of reasoning except that of being conscious and, thereby self-controlled, and thereby being *critical*. You seem to me tacitly to assume that the process of perceiving a line is considerably simpler than my observations have led me to surmise that it is, (and in some measure to test my surmise). However, I must not put much stress on that, since I have no leisure to expound my theory.

By the way, since Garrison's death, an important item of bread and butter has been almost wholly cut off from me by my no longer being invited to write for the *Nation*. There is a person on the staff who I believe thinks himself a very superior philosopher,—as most students of the subject severally rate themselves. It is very singular and seems to show that their methods of determining their valuations are at fault, since there is no room for half of them to be right. I thought it likely, too, that your letter about my remarks on Celestial Dynamics increased their indisposition to trust to me. The whole difference between us seems to me to have consisted in my using the word "calculation" in a well-established sense considerably broader than your interpretation of what I said. I meant that there was no present prospect of important general physical discoveries, such as those of Keppler and Newton flowing from the work (unless perhaps centuries hence) nor even of any mathematical theory comparable for instance with Laplace's functions in importance. If anything of the kind is to come from your study of the movement of *Mars*, *tant mieux*! Well, I only introduce the matter to say that if you are disposed to do me such a good turn, a word dropped in conversation with Lamont might do me and those to whom I may be of any use more service than you would think.

Very faithfully
C. S. Peirce

These letters are not only a valuable addition to scientific Americana of their period but serve also to deepen our acquaintance with two outstanding personalities of that epoch. That these men left an indelible imprint on the intellectual life of America cannot be denied. They came by their intellectual powers and earned personal distinction in such strikingly different ways that one is reminded again of the criterion by which Peirce would judge a man's greatness. It was formulated to read,

> Who, for instance, shall we say are the great men of science? . . . Some hold that they are fashioned of the most ordinary clay, and that only their rearing and environment, conjoined with fortunate opportunities, make them what they are. The heaviest weight, intellectually, among these writers, maintains, on the other hand, that circumstances are as powerless to suppress the great man as they would be to subject a human being to a nation of dogs. But it was only the blundering Malvolio who got the notion that some are born great; the sentence of the astute Maria was: "Some are become great, some atcheeves greatnesse, and some have greatnesse thrust uppon em." . . . My opinion will, I fear, be set down by some intellectual men as foolishness, though it has not been lightly formed, nor without long years of experimentation—that the way to judge of whether a man was great or not is to put aside all analysis, to contemplate attentively his life and works, and then to look into one's heart and estimate the impression one finds to have been made. . . . The great man is the impressive personality; and the question whether he is great is a question of impression.[82]

[82] The century's great men in science, *The Evening Post*, Jan. 12, 1901.

THE FOUNDING OF THE NATIONAL ACADEMY OF SCIENCES—A REINTERPRETATION [1]

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(*Read November 16, 1956*)

In every period in the history of the United States an impulse has existed toward the creation of a central scientific organization. Although varying greatly from age to age in intent and composition, each of the resulting institutions has had two characteristics in common. Each has been national in the sense that it had some relationship with the Federal Government. Each has also attempted to embody the hopes and aspirations of the scientific community of the country independently of any official tie. The perennial models overseas, the Royal Society of London and French Academy, both in their own way combined these characteristics. Of the various efforts in the United States, the founding of the National Academy of Sciences was the most direct and self-conscious attempt to fill the void at the center which American science has felt in every generation.

The usual way of describing the origin of the National Academy is to say that it was created by President Lincoln in 1863 to assist the government in the Civil War.[2] By an easy analogy this statement is often translated into twentieth-century language thus: the National Academy was the Civil War version of the World War II Office of Scientific Research and Development. A closer examination of the circumstances surrounding the establishment of the Academy and the ideas of the men involved, however, leads to the conclusion that the Civil War was merely the occasion and not the cause of the birth of the Academy. Indeed, the essential lines of the organization had been formulated by 1851, and, what is more important, a closely-knit group of men worked toward a national academy from that time onward. When they had succeeded in 1863, their attempt to enter the field of weapons research was almost a complete failure, and it was their losing control of the organization after the war which finally enabled it to survive.

As president of the American Association for the Advancement of Science in the third year of its existence, Alexander Dallas Bache addressed the meeting at Albany, New York, in 1851. He was the superintendent of the United States Coast Survey, the strongest and most permanent government effort in science to that time, and hence in a good position to see the problem of central scientific organization in its broad dimensions. After surveying the institutions of both America and Europe, he declared that "an institution of science, supplementary to existing ones, is much needed in our country, to guide public action in scientific matters." He proposed appropriations from the treasury for a council which "by the sound advice . . . in regard to the various projects which are constantly forced upon" government officials would save many times its own cost. He visualized a membership spread throughout the country which could by "minute subdivision" of the efforts of many professional scientists bring maximum assistance to the government.[3] Although nothing immediately came from Bache's proposal, the idea did not die during the 1850's.

When Bache stood before the AAAS as the retiring president, he also had another title. He was the "Chief" of a high-spirited group who called themselves the Scientific Lazzaroni. Pledged to eat dinner together when the AAAS or the American Philosophical Society was meeting, the membership included a fair share of the scientific brains of the country. Besides Bache, the physicist Joseph Henry, the mathematician Benjamin Peirce, the naturalist Louis Agassiz, and the geologist James Dwight Dana were without peers

[1] Parts of the following paper have appeared in somewhat altered form in Dupree, A. Hunter, *Science in the federal government: a history of policies and activities to 1940*, Cambridge, Massachusetts, Belknap Press of Harvard University Press, 1957, and are used here with the permission of the Harvard University Press.

[2] The standard account of the founding of the National Academy is True, F. W., *A history of the first half-century of the National Academy of Sciences, 1863–1913*, Washington, National Academy of Sciences, 1913.

[3] Bache, A. D., address, *Proc. Amer. Assn. Adv. Sci.* **6**: xli-lx, 1851.

in their own fields, and among the lesser lights were such energetic young men as the astronomer Benjamin Apthorp Gould and the chemist Wolcott Gibbs. Besides their joy in each other's company, they were dedicated to raising the standards of the country's science and to creating worthy institutions for young America.[4] They tried to establish a national university in Albany and later backed the Dudley Observatory there. They also talked during the 1850's of a national university in New York City. Because of Bache and Henry on the one hand and Agassiz and Peirce on the other, the main centers of strength for the Lazzaroni were in Washington and in Cambridge, Massachusetts. If they could have found support, the Lazzaroni would have moved forward to create both a real science-centered university and a national academy during the 1850's, with weapons research a very minor consideration.

Only after the outbreak of the Civil War, however, did the Lazzaroni find a favorable climate for their operations. In the first place, the secession of the South ended a deadlock of years in the Congress and allowed new legislation with a rush, including the Morrill land-grant act for the establishment of agricultural and mechanical colleges in each state. In the second place, the Lazzaroni in Cambridge, Peirce and Agassiz, succeeded in placing a friend, James Hill, in office as President of Harvard University, and they quickened to the dream of establishing a science-centered university on the framework of Harvard's Lawrence Scientific School with the aid of the Morrill land grant for Massachusetts. In the third place, the Washington Lazzaroni, Bache and Henry, along with their friend Admiral Charles Henry Davis, had, in their offices at the head of the Coast Survey, the Smithsonian Institution, and the Navy's Bureau of Navigation, risen to positions of influence in wartime Washington.[5] In this last respect alone did the war itself provide the group wishing a national academy with an additional opportunity. And even here to a large extent the three men represented the institutions developed in the decade and a half before the war.

Early in January, 1863, Benjamin Peirce wrote to Bache inquiring about the next meeting of the Lazzaroni.[6] By late January the meeting was set for about February 21 in Washington, with Peirce planning to be at the capital from February 14 to February 23.[7]

Meanwhile the Washington Lazzaroni Bache and Henry, with Admiral Davis, got together sometime late in January to discuss the immediate possibility of setting up a "National Association under an act of Congress." Now that it came to a practical question Joseph Henry urged objections. First, he "did not think it possible that such an act could be passed with free discussion in the House—that it would be opposed as something at variance with our democratic institutions." He also feared the jealousy and ill feeling created among those scientists who were left out. Congress could not be depended on to provide appropriations, and there was danger the whole thing would be used for political ends.[8] Bache appeared to Henry to be convinced. At any rate the chief stopped talking about a national academy. Instead, the three men arranged for the Navy Department to form a Permanent Commission, which was destined to last the remainder of the war.

The Permanent Commission, made up of Bache, Henry, and Davis, met frequently, examining proposals for new weapons and occasionally making some tests. The last report, in 1865 was numbered 257. This was the nearest thing to a central war scientific agency achieved during the Civil War.[9]

While the Permanent Commission got under way, however, Bache, Davis, and the Cambridge Lazzaroni had no real intention of heeding Henry's caution. What they needed was a friend in Congress, and Louis Agassiz produced one in Senator Henry Wilson of Massachusetts. The brilliant zoologist had evidently worked on the project for some time, for on February 5 Peirce reported that Agassiz had written to Wilson "to go ahead upon the National Academy of Science," and referred the Senator "to one . . . A. D. B. as our chief in all such matters, and as capable of furnishing him a complete plan fit to lay before Congress in 24 hours."[10] Thus the wheels were still turning.

[4] Storr, R. J., *The beginnings of graduate education in America*, 82–93, Chicago, University of Chicago Press, 1953; in the preparation of this section I have benefited from information furnished by Edward Lurie.

[5] The correspondence between A. D. Bache and Benjamin Peirce in the Peirce Papers, Harvard University Archives, indicates the range and nature of Lazzaroni activity.

[6] B. Peirce [Cambridge] to A. D. Bache, January 5, 1863, Harvard University Archives.

[7] B. Peirce [Cambridge] to A. D. Bache, January 30, 1863, Harvard University Archives.

[8] J. Henry, Washington, to Louis Agassiz, August 13, 1864, Peirce Papers, Harvard University Archives (see Appendix).

[9] Reports of the Permanent Commission, 1863, 1864, 1865, National Archives.

[10] B. Peirce [Cambridge] to A. D. Bache, February 5, 1863, Harvard University Archives.

Agassiz was fond of pointing to the founding of the University of Berlin in 1810 as an example of what a nation could do in a time of crisis,[11] but in spite of the glory of the enterprise an exquisite care was necessary when moving behind the back of Joseph Henry.

Agassiz reached Washington on the afternoon of Thursday, February 19, 1863. Although Henry expected him at the Smithsonian, he "put up at Bache's."[12] That evening Senator Wilson called, and besides Bache and Agassiz, Peirce and Benjamin Apthorp Gould foregathered for the Lazzaroni dinner on Saturday, were there. They perhaps had as a tangible basis for discussion a plan of an academy drawn up by Davis which had a rather cumbrous if open method of selecting the original members. However, counsels for speed and secrecy prevailed at the meeting. When Wilson emerged he had with him the draft of a bill which named fifty scientists, incorporated them as individuals into a National Academy of Sciences, and gave them the power to perpetuate themselves by filling vacancies.[13]

The Lazzaroni, of course, were on the list in full force, together with those so eminent in their fields that no one could possibly leave them off, such as, John Torrey, Asa Gray, Jeffries Wyman, and William Barton Rogers. But there were also several rather conspicuous omissions.

Senator Wilson introduced the bill in the Senate on February 21, 1863.[14] The third section provided that "the Academy shall, whenever called upon by any Department of the Government, investigate, examine, experiment, and report upon any subject of science or art. . . ." This was clearly the advisory body envisioned in 1851 by Bache. Not mentioned, but implied positively by the limited number of places and negatively by the prohibition on compensation, was the honorary nature of membership. Appropriations could be had only in relation to a request from some department of the government. A general statement of principles and many details vitally affecting the nature of the organization were left to the fifty incorporators.[15]

Joseph Henry within a day or two, "on accidentally calling at the Coast Survey," found that "the whole matter was in the hands of Senator Wilson!"[16] Although he did not approve of the secret method of choosing the list of members he did not object strenuously because he did not believe the bill would pass—"indeed there are very few occasions when acts of this kind could be passed without comment or opposition."[17] This generally excellent judgment of the political scene reckoned without the possibility that Henry Wilson might find one of the few exceptional occasions.

The Senator essentially depended on the pressure of adjournment. This was the lame-duck thirty-seventh Congress, elected back in 1860, and the session automatically ended at midnight, March 3, 1863. As the Senate rushed through matters large and small on that last day, Wilson followed a long line of private petitions by asking "to take up a bill which will consume no time, and to which I hope there will be no opposition. . . . It will take but a moment, I think, and I should like to have it passed." When no objection arose, he suggested it was "unnecessary to read the first section of the bill, which merely contains a list of names of the corporators." A preoccupied Senate, after listening to the reading of sections two and three, passed the bill without a recorded vote and moved on to consider declaring a "Day of Prayer and Humiliation."[18] The House took up the Senate's bill considerably after seven o'clock in the evening and passed it without comment. Lincoln evidently signed it the same evening.[19]

This demonstration of legislative pliability reveals remarkably little about the basic forces producing a National Academy. The Congress as an entity had not spoken in any positive sense. Still less had the nation spoken through its chosen representatives. That the great crisis of the day made the congressmen feel they were the agents of destiny is possible, but that they connected this particular legislation with their immortal reputations is highly unlikely. Wilson did prove he knew his way around in the last minute rush, and a little group of scientists, five at the most, proved they knew what they wanted. By 1863 the professional scientists had reached a point where they only needed the politicians to put a legal rubber stamp on their arrangements.

But the secrecy that had produced such remarkable results in Congress could not last. On March 5 Henry found out the bill had become a law.[20]

[11] Agassiz, E. C., ed., *Louis Agassiz: his life and correspondence* **2**: 569–570, Boston, Houghton Mifflin, 1885.

[12] John Torrey, New York, to Asa Gray, March 9, 1863, Gray Herbarium of Harvard University.

[13] Davis, C. H., *Life of Charles Henry Davis, Rear Admiral, 1807–1877*, 290, Boston, Houghton Mifflin, 1899.

[14] True, *op. cit.*, 5

[15] *Ibid.*, 352.

[16] Torrey to Gray, March 9, 1863.

[17] Henry to Agassiz, August 13, 1864.

[18] *Congressional Globe*, March 3, 1863, 37 Cong., 3 Sess, 1500–1501.

[19] True, *op. cit.*, 6.

[20] Torrey to Gray, March 9, 1863.

Letters from Wilson to the fifty incorporators spread the news through the country, catching even some of the most eminent by surprise. It took little longer for the ones passed over to realize what had happened. On March 7, George C. Shaeffer, "a *savan* in one of the departments," walked into Admiral Davis's office and "flew out against the Academy in good, set terms." [21] John Torrey of New York reported that "the whole matter was concocted by the party assembled at the Coast Survey." [22]

The opposition tended to center in Cambridge, not so much among those left off the list as among those who had long-standing disagreements with the leading Lazzaroni members. The botanist Asa Gray was triply involved. He had long been the antagonist of Agassiz concerning the evolution of species and the ideas of Charles Darwin. He had also opposed the plans of Agassiz for the Lawrence Scientific School, and he was fearful that a new national organization might adversely affect the American Academy of Arts and Sciences in Boston, which he had long served. William Barton Rogers, president of the new Massachusetts Institute of Technology, was opposed to Agassiz and Peirce on the disposition of the Morrill land grant for Massachusetts and was also an ardent evolutionist. If these two joined Joseph Henry in publicly opposing the Academy, it could scarcely have survived.[23]

Here indeed was a crucial decision for Henry. One word of disapproval from him would have set the match. But he was not the man to let the less than candid behavior of his Lazzaroni friends influence him. While making no secret of the course of events in February, and still placing "but little faith in appropriations of Congress," he concluded to attend the first meeting "and do what I can to give it a proper direction." [24]

The organization meeting at New York in April, 1863, which thirty-one of the fifty attended, found the Lazzaroni in firm control. Bache became the first president and members of his group took all the other important offices. Only the voice of William Barton Rogers spoke against them.[25]

Although Bache emerged from the organization meeting in triumph, the opposition was far from dead. Admiral John A. Dahlgren sent in his resignation in May.[26] Whatever his motives, the withdrawal of the man in charge of the Navy's Bureau of Ordnance was a severe blow to the Academy's ambition actually to function as scientific adviser to the government. A clear test of the Lazzaroni interest came in the election of the president of the American Academy of Arts and Sciences in Boston later the same month. Peirce lamented to Bache that "to show their hatred of the National Academy, all its opponents combined to elect Gray as President and William B. Rogers as Recording Secretary." [27] Gray still did not take a public stand on the National Academy, concluding to "say and do nothing—at present, and see," but he considered it "strictly governed by Coast Survey and Agassiz clique." [28]

By the fall of 1863 even some of the Lazzaroni had doubts about the Academy. Benjamin Peirce confessed to Bache that he feared "we have made a mistake in founding the Academy—and that it may not be so great a misfortune if its enemies were to succeed in overturning it." [29] Despairing of "the growing falseness of Washington," he felt that for "men seeking truth to meet there, is like a party of poets meeting in a cotton machine . . . of angels in the palace of Beelzebub or of imps in Abraham's buzzum." [30] Thus the question had changed from whether a small group of American scientists could form and dominate a national academy to the more desperate one of whether all American scientists working together could make a corporate body survive in the harsh realities of 1863.

Bache did not delay his attempt to establish the Academy as the government's adviser. On his own authority he set up committees and had them ready to report at the meeting in Washington in January, 1864. Taken together, the committees make it clear that Bache and Davis personally inspired all the requests that came to the Academy in 1863. The total results were modest enough, and when the committees unrelated to the war effort are ruled out the remainder of service is negligible. The four committees of 1864, while not emanating directly from Bache and Davis, made no better record. No wartime committees

[21] Davis, *op. cit.*, 292.

[22] Torrey to Gray, March 9, 1863.

[23] Asa Gray, Cambridge, to Joseph Henry, April 18, 1863, Gray Herbarium of Harvard University.

[24] Joseph Henry, Washington, to Asa Gray, April 15, 1863, Gray Herbarium of Harvard University.

[25] True, *op. cit.*, 21.

[26] *Ibid.*, 62.

[27] B. Peirce [Cambridge] to A. D. Bache, May 27, 1863, Harvard University Archives.

[28] Asa Gray, Cambridge, to George Engelmann, September 2, 1863, typed copy at Gray Herbarium of Harvard University.

[29] B. Peirce, Cambridge, to A. D. Bache, October 18, 1863, Harvard University Archives.

[30] B. Peirce, Cambridge, to A. D. Bache, October 26, 1863, Harvard University Archives.

date later than May 2, 1864, when Grant was just beginning his campaign with the Army of the Potomac and nearly a year of fighting lay ahead.[31] When compared with the 257 reports made by the Permanent Commission, the advice rendered by the National Academy appears slight.

The torpidity that overcame the Academy in the spring of 1864 coincided with the serious illness of its architect, Bache. With their "darling chief" incapable of further duty, the Lazzaroni maintained their quarrelsomeness without the energy and direction that the greatest government scientist of the whole period had imparted to them. Agassiz came close to precipitating a mass resignation of naturalists by fighting the election of Spencer Baird in the summer of 1864. But this election meant that the little group who controlled decisions so easily in 1863 had met an open rebuff. Joseph Henry warned Agassiz that in "this Democratic country we must do what we can, when we cannot do what we would. We must expect to be thwarted in many of our plans." [32]

Through the years 1865 to 1867 attendance at meetings trailed off. With Bache ill, James D. Dana resigned the vice-presidency, leaving Henry as a kind of receiver for the organization. But Bache, even in his death, gave his creation the impetus to survival. By leaving the National Academy the bulk of his estate and by making Henry feel an obligation to continue it, he gave the support and the leader necessary to weather the crisis. Henry wrote, "I very reluctantly accepted the office of President and I was principally induced to do so at the earnest solicitation of Mrs. Bache, who since her husband was the first president, and because his fortune after her death will be under the care of the Academy, is exceedingly anxious that it should be perpetuated." Henry was "far from desiring that it should expire in my arms; but how to preserve its life and render it useful is a different problem." [33]

Between 1867 and 1872 Henry developed a program for the salvation of the Academy. He made the prime consideration for membership "original research," with no one "elected into it who had not earned the distinction by actual discoveries enlarging the field of human knowledge." This definitely shifted the emphasis in the purpose of the Academy from practical service to the government to the recognition of "abstract science." [34] Henry also had Congress remove the limit of fifty on the number of members. Twenty-five new members were elected at once in 1872, bringing in several who had earlier been passed over and also some energetic younger men. By Henry's policies the life and dignity of the Academy were assured, while the gifts of Bache and others provided sufficient money for it to operate as an honorary society if not as a research establishment for the government. No longer the chosen instrument of a small and spirited group, the Academy lived because Henry, who had no great positive program for it, realized that to allow such an organization to die would do severe damage to the prestige of science in America.

This view of the early history of the National Academy of Sciences brings to light some flaws in the foundation. The secrecy and the irresponsibility of the selection of the original fifty robbed the Academy of a clear chain of responsibility to the government. The brief attempt to enter the field of military research was not successful even in 1863 and 1864, thus promising little for later emergencies. Yet on another level, this story gives the Academy a broader significance from the beginning. Its organic act had the potentiality of becoming a permanent rallying point for science in the country. And the inception of the idea in the 1850's indicates that the organization was intended to serve the government throughout all the activities which used or needed science. The National Academy was a monument to Bache's peacetime dream of elevating the position of science in America.

APPENDIX

The following letter from Joseph Henry to Louis Agassiz, heretofore unpublished, gives much of the flavor of the founding days of the Academy as well as a picture of its workings in 1864. The original is in the Benjamin Peirce Papers, Harvard University Archives.

Smithsonian Institution
Aug. 13th: 1864

My Dear Professor

I have just returned to this city and find your letter of the 8th awaiting my arrival. At the Depot at Phild I met our friend Mr. Felton who after some remarks relative to the family of his lamented Brother; turned the conversation to yourself; and said, that when he saw you, a short time before, he thought you were looking very ill,—that you were too much occupied, with various matters, and that he had strongly urged

[31] True, *op. cit.*, 206–226.

[32] Henry to Agassiz, August 13, 1864.

[33] Joseph Henry, Washington, to Asa Gray, July 8, 1868, Gray Herbarium of Harvard University.

[34] True, *op. cit.*, 13–15.

you, on your own account, and on that of your family, to give up all care, and for a time to think of nothing but the reestablishment of your health.

The perusual of your letter has rendered the importance of the advice of Mr. Felton strikingly evident to me; and in view of the present condition of our much esteemed friend Professor Bache, whose malady I trust may be but temporary, I beg that you will take a more cheerful view of the proceedings at New Haven; or rather that you will banish them entirely from your mind. It is of much more importance to the science of the world that your health and life should be preserved than that the academy should be rapidly advanced to your ideal standard of perfection. In this Democratic Country we must do what we can, when we cannot do what we would. You must expect to be thwarted in many of our plans and learn how to bow before defeat with the consolation of knowing that if we have not succeeded in our aim we have at least deserved success.

After a calm review of the proceedings at New Haven I think them much more favourable than under all the circumstances of the case there was reason to expect they would be at the commencement of the meeting.

Permit me to give you a candid and free exposition of my views of the matter and for this purpose to go back to the beginning of the academy. Several weeks before you and the other originators of the academy came to Washington Professor Bache asked my opinion as to the policy of organizing a national association under an act of Congress. I stated in reply; *First*, that I did not think it possible that such an act could be passed with free discussion in the House—that it would be opposed as something at variance with our democratic institutions. *Second*—that if adopted it would be a source of continued jealousy and bad feeling—an object of attack on the part of those who were left out. *Thirdly*—that although it might be of some importance to the Government yet it would be impossible to obtain appropriations to defray the necessary expenses of the meetings and of the publication of the transactions. *Fourthly*, that there would be great danger of its being perverted to the advancement of personal interest or to the support of partizan politics. With these views, I thought, Professor Bache was impressed. He said no more to me on the subject and I heard nothing further in regard to it until after the whole scheme was organized and in charge of Mr. Wilson of the Senate.

Besides the objections I had presented to Professor Bache I did not approve of the method which was adopted in filling the list of members. It gave the choice to three or four persons who could not be otherwise than influenced by personal feelings at least in some degree; and who could not possibly escape the charge of being thus influenced. I did not, however, make any very strenuous objections to the plan because I did not believe it could possibly become a law; and indeed there are very few occasions when acts of this kind could be passed without comment or opposition. After, however, it had become a law I resolved to give the academy very hearty support; and I have since faithfully and industriously endeavoured to advance its interest.

My anticipations in several particulars have been realized—an antagonism, such as I feared, has been produced in the minds of those who think themselves ill used in being left out; while a considerable number of those who were elected feel that they ought to have been consulted in making out the list of names. The feeling also exists, to a considerable extent, that the few who organized the academy intend to govern it; and I think this was the *animus* which excited the determination to elect Professor Baird. He was the choice of a large majority of the cultivators of Natural History; and although your opposition was honest in intention, and your position correct in general principle yet I think that had you prevailed in your opposition, a majority of all the naturalists would have resigned; and a condition of affairs would have been produced deeply to be deplored. I fully agree with you in opinion, and I presume the philosophical world would also concur with you, that as a class of investigations those which relate to Physiology and the mode of production and existence of organic forms are of a higher order than those which belong to descriptive Natural History. The good however which two persons may have done to science in these two classes will depend on the relative amount, as well as, on the character of their labours. Besides this you ought to have commenced with the application of principle of the higher investigations, in the formation of the Academy, for you could not reasonably expect that any member would vote to disparage his own pursuit.

It is true I voted for Mr Baird and taking all things into consideration I am sure I did right in doing so. I do not agree with you in thinking that my having voted for him will give him the power to control the policy of the Institution; neither do I think that the proposition you made at the meeting of the Board of Regents has any connection whatever with the vote in the academy. It is the same which I have advocated from the first, and which I doubt not will meet the approval of the majority of the intelligent naturalists of the world. If Mr. Baird should attempt to interfere with the policy of the Institution I would not hesitate to ask him to resign, and to insist on his doing so; as I did in the case of Mr. Jewett. But I have not the least idea of any trouble with him in this way; or that for many years to come any thing can be done in the way of carrying out your proposition. Had the war been brought to an end last spring we might have indulged a hope of this kind; but the immense ad-

ditions which have been since made to the national debt will induce a very cautious policy in regard to the appropriation of the public funds.

You do me but simple justice in supposing that I would not willingly join in any intrigue to advance personal or party ends. In the whole course of my life I have never engaged in any thing of the kind and it is now too late for me to change my character in this respect. It is necessary however sometimes to have an eye on the acts of others in order to thwart their improper designs.

I think you are regarding this matter of the academy in so serious a light that it will unfavourably affect your health and spirits. I fully agree with you in opinion as to the desirableness of elevating the standard of American science; but we must recollect that great changes are seldom or never produced *per saltum* and that we frequently waste our strength in endeavouring to suddenly overcome an obstacle which will gradually give way under a gentle but constant pressure. I fear had you succeeded in excluding Baird from the academy on the ground of the character of his investigations you would have aroused a large amount of personal opposition and have been subjected to criticisms and other annoyances which to a nature like yours, craving love and sympathy, would have been exceedingly painful. Why trouble yourself so much about the character of American science which can only be improved with the social and political conditions which tend to encourage and develop it. You have already done good service by your presence in this country,—by your immediate instruction and by the enthusiasm and sympathy, which you never fail to awaken. You are formed to lead men by the silken words of love rather than to urge them on by the rough method of coercion. Let me beg of you therefore, my Dear Professor, to first take care of your health and secondly to devote yourself for the remainder of your life to those investigations which have given you so wide and permanent a reputation and in which at every step you can elevate yourself in your own self esteem as well as in the admiration of the world; and afford to look down with complacency on the means to which ordinary men resort to raise themselves into temporary notoriety.

It is lamentable to think how much time, mental activity, and bodily strength have been expended among us during the last ten years, in personal altercations, which might have been devoted to the discovery of new truths;—to the enlargement of the bounds of knowledge, and the advancement of happiness. There is cause for this which might be discovered; and I will venture just to mention a principle of action which may have had some influence in producing the results. I allude to the principle of supporting our friends right or wrong. I grant that this principle of action springs from the generous impulse of a warm heart; but it does not receive the approval of the moral judgement of a cool head. We are not true to our friend if we follow, or assist him, in a single step in the wrong direction. You lost an invaluable friend in Professor Felton who with his unselfish disposition, and expanded sympathy ever acted as a bond of harmony and union between all the varied characters that constitute the faculty and associates of Cambridge; and should it be the design of Providence to remove Professor Bache, which Heaven in its mercy forbid, a similar change, though of a somewhat different character will be felt in the circle of which he is the controlling centre.

August 28th. Thus far I had written on the day of the date of the first part of this letter; but I was a little doubtful as to how you might receive some parts of the communication and amidst an unusual pressure of engagements I have suffered it to remain in my portfolio until tonight, when I am on the eve of leaving this city with my family. On reading however what I have written I am sure that you will receive it in the same spirit in which it is written and although you may not agree with me in all the positions I have taken I trust you will find, in none of them, cause of offense.

I have never been more severely worked than I have been since I last saw you in New Haven. On account of the illness of the wife & daughter of Professor Baird he was obliged to leave this city about the first of July; and the unexpected and very sudden death of the wife of Mr. Rhees has rendered him unfit to discharge the duties of his office and he has gone to the western part of the state of N. Y. I have therefore been alone in the Institution; and with the call upon my time from the Light-House Board—the permanent commission and other business connected with the government I have scarcely had a moment of rest, except while in bed, for some weeks past.

I start tomorrow morning at six o'clock to take Mrs. Henry & Helen to Chesnut Hill near Phild and Mary and Caroline to Shelter Island, to pay a visit to Professor Horsfords family which has been long owed. Helen is not very well though I think she is somewhat better—certainly not worse than when you were last in Washington.

I have written to Professor Baird to give him a statement of your course in regard to his election. I shall give him, when we meet a more full exposition of your views. He should know that his election was not entirely a compliment to him since some voted to sustain a principle, and others voted for him because he was the ostensible choice of the majority of the naturalists present. I shall probably visit Boston some time before the middle of Oct. and will confer with you on the topic of this letter. With kind regards to Mrs. Agassiz I remain your

Friend &c &c

Joseph Henry

Professor Agassiz

ACADEMIC FREEDOM—THE ROLE OF THE PROFESSIONAL SOCIETIES

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(*Read April 25, 1957, in the Symposium on Academic Freedom*)

THE first subject suggested for this talk was "The Role of the American Association of University Professors." The present title is better since it gives me a longer rope with which to reach greener grass or with which to hang myself. Moreover, it would not have been fair to an organization that excludes deans and presidents to be the sole topic of an administrator.

Near the beginning of the century organizations were becoming national. Inevitably there would be organizations of college teachers and organizations of college administrators. The leading organization of college teachers, the American Association of University Professors, calls itself just that, while college presidents united as the Association of American Colleges or the Association of American Universities. Is this through a paranoiac mistake in identity or, more charitably, as a means of justifying travel expenses?

Of course these organizations did not invent the problems of academic freedom nor were they the first to suggest solutions. The past, as well as the future, contains many differences between individuals and the administrations of colleges on matters of religion, politics, economics, or personal behavior. However, the leaders of the profession, including the administrative officers of many colleges, had long believed that truth was more apt to be discovered under great freedom than through restricted research, more apt to be recognized in the open forum of ideas than through compulsion, and that a wide diversity of points of view and of artistic and literary expression is enriching in the life of the individual and of the community. It was clear that many a fool must be suffered, most ungladly, in order not to stifle the sage.

When the American Association of University Professors was organized, it was not evident that academic freedom would become one of its absorbing topics or that it would undertake the investigation of individual cases of alleged abuses. I am told that a *New York Times* editorial, calling for a definitive judgment from the recently born organization concerning the dismissal of a group of professors in Utah, aroused John Dewey who, on a bus ride with Lovejoy, said: "If you will give the time for an investigation, I will give the money." The furrow has proved long.

The second facet of the Association's activities in regard to academic freedom—the attempt to establish through published standards guiding principles for faculty and administrations—was started soon after. In 1925–1926 a statement, agreed upon by representatives of the Association of American Colleges and the American Association of University Professors and other groups, was endorsed by these two organizations and published. The statement is short, dogmatic, and useful—yet incomplete, and gives no disclosure of the reasoning behind the creed. It deals with both academic freedom and tenure and in regard to the former lays down four principles with modifying clauses. These specified: (1) Full freedom of investigation; (2) Freedom of teaching one's own subject and expounding it outside the classroom, modified by the immaturity of students and by pre-stipulated regulations required by any partisan or religious connection which the institution may have; (3) No right to discuss in class irrelevant, controversial topics outside the subject of the course; (4) The absence of institutional responsibility for the views expressed by the faculty member as a citizen outside the institution and the recognition of his full right as such. This statement proved of much value but within a decade it was clear that it needed revision and clarification.

The American Association of University Professors and the Association of American Colleges, through a joint committee, prepared a new and superseding statement endorsed before the end of 1941 by both organizations. The basic principles, described above, were reiterated although no limitation due to the immaturity of students was mentioned. It differed from the earlier statement in that the description of the principles regarding academic tenure is more precise, the connection of tenure and academic freedom is explicitly stated,

and academic freedom is described as a prerequisite for a college to fulfill its function in the public service.

> . . . Institutions of higher education are conducted for the common good and not to further the interest of either the individual teacher or the institution as a whole. The common good depends upon the free search for truth and its free exposition.
>
> Academic freedom is essential to these purposes and applies to both teaching and research. Freedom in research is fundamental to the advancement of truth. Academic freedom in its teaching aspect is fundamental for the protection of the rights of the teacher in teaching and of the student to freedom in learning. It carries with it duties correlative with rights.

The 1941 Statement also presents one dilemma: It states that tenure supports academic freedom but, recognizing the necessary probationary period, it also declares: "During the probationary period a teacher should have the academic freedom that all other members of the faculty have." This implies not only exemplary behavior on the part of the administration but a toleration that is apparent on the part of a young man's elder colleagues.

It should be clear that these statements do not give standards created in the abstract but rather descriptions of what has risen to the top of the academic conscience through the successful maintenance of freedom in many institutions and through the recognition of the role of the scholar in the administration of his own function in society.

The end is not yet. The Association of American Colleges and the American Association of University Professors currently are studying the clarification of procedures appropriate in case of the dismissal of a faculty member who has tenure. "Due process" and the evaluation of one's peers in such cases are not only a protection to the faculty member but to the good name of the institution.

Since 1941 not only procedural but substantive problems not foreseen at that date have arisen and the degree to which the 1941 Statement is valid and adequate has been questioned. I shall discuss these problems under three main headings: (1) The problem of the communist on the faculty; (2) the problem of cooperation or non-cooperation with investigatory bodies; (3) the problem of security in scientific investigation.

The communists in American faculties are rare. Even those charged with communism are few in number. Most of these are either ex-communists, liberals to the left of the accuser, or indiscreet joiners and petitioners. Almost all agree that the ex-communist should not be an outcast, that the University should tolerate faculty members far to the left as it already does those far to the right, and that "babes in the woods" may still be competent scholars.

Opinions differ regarding those known to be members of the Communist Party. Here the Association of American Colleges has made no statement but we have disagreement between the declaration of the Association of American Universities and that of the American Association of University Professors. In a special statement adopted in 1953, the Association of American Universities states:

> Appointment to a university position and retention after appointment require not only professional competence but involve the affirmative obligation of being diligent and loyal in citizenship. Above all, a scholar must have integrity and independence. This renders impossible adherence to such a regime as that of Russia and its satellites. No person who accepts or advocates such principles and methods has any place in a university. Since present membership in the Communist Party requires the acceptance of these principles and methods, such membership extinguishes the right to a university position.

On the other hand, in January, 1951, the American Association of University Professors approved a Statement of Principles from which I quote:

> . . . No rule demanding removal for a specific reason not clearly determinative of professional fitness can validly be implemented by an institution, unless the rule is imposed by law or made necessary by the institution's particular religious coloration. . . . This principle governs the question of dismissal for avowed past or present membership in the Communist Party taken by itself. Removal can be justified only on the ground, established by evidence, of unfitness to teach because of incompetence, lack of scholarly objectivity or integrity, serious misuse of the classroom or of academic prestige, gross personal misconduct, or conscious participation in conspiracy against the government. . . .

Very few of the extreme left-wingers whom I have known, persons who were either communists or strongly sympathetic with them, have in my opinion been fit to be members of a university faculty. Their judgments were not objective, their statements not intellectually honest, and their emotions lacking in control. However, although admitting they are exceptions, I have known some persons I believe to be ex-communists who went into the movement because of fervor of conscience and left it because of honesty of conscience but

who at all times would have been fit teachers and investigators. I agree with the statement of the American Association of University Professors that even membership in the Communist Party should not by itself be determinative of the decision to retain or dismiss a faculty member.

Even less satisfactory, it seems to me, is the statement of the Association of American Universities in regard to faculty members who do not answer fully questions presented to them by investigatory bodies. In regard to this matter the Association of American Universities declares:

> . . . In this respect, invocation of the Fifth Amendment places upon a professor a heavy burden of proof of his fitness to hold a teaching position and lays upon his university an obligation to reexamine his qualifications for membership in its society.

whereas the stand of the American Association of University Professors is that:

> . . . The exercise of one's constitutional privilege against self-incrimination does not necessarily or commonly justify an inference of criminal guilt; and even if it were to be ruled otherwise, it would not follow that the loss of an academic position should automatically result from a legal offense, whether proved in court or established by inference, without consideration of the relation of the offense to professional fitness. Invocation of the Fifth Amendment is to be weighed with an individual's other actions in passing a judgment on him. . . .

The Statement of the Association of American Law Schools, distributed to universities in March, 1955, is even better in this regard:

> 2. If a member of a faculty refuses to answer legislative committee questions, that action in and of itself, while it warrants an inquiry, does not justify automatic dismissal. This is particularly true where the refusal is based on constitutional grounds. For, unless the practical benefits of the Constitutional protection to witnesses are to be negated, employers and other persons may not rightfully dismiss such a witness on the ground that his invocation of a constitutional privilege is an immoral or otherwise disqualifying act. Accordingly, a college or university should not dismiss a member of its faculty on the ground that he has been guilty of misconduct solely because he refused on Fifth Amendment grounds to answer the questions of a legislative committee.
>
> 3. Refusal to answer legislative committee questions does not of itself warrant dismissal. Refusal does justify an inquiry by the proper college or university officials to determine whether suspension, dismissal, or other disciplinary proceedings should be instituted. The inquiry is justified not because claim of the Fifth Amendment or other constitutional privilege automatically warrants the inference that the answer to an incriminating question, if given, would have been "Yes," or because the claim of a constitutional privilege is an immoral act. The inquiry is justified because some refusals to answer are used to conceal misconduct of the witness while other refusals are not so used. The specific cases can be distinguished from each other only by careful and painstaking investigation in each instance.

I recommend that this Statement be read in its entirety by those interested in academic freedom. It is a magnificent document.

In respect to these statements I feel even more strongly than I do in respect to the statements concerning communist membership, for I believe the Association of American Universities allowed itself to take an almost irresponsible attitude toward civic rights and the proper freedom of faculty members. The Supreme Court in Slochower *versus* the Board of Education of New York states:

> . . . we must condemn the practice of imputing a sinister meaning to the exercise of a person's constitutional right under the Fifth Amendment. . . .

and again:

> The privilege against self-incrimination would be reduced to a hollow mockery if its exercise could be taken as equivalent either to a confession of guilt or a conclusive presumption of perjury. . . .

However strongly I disagree with the members of the Association of American Universities and deplore the fact that they borrowed the prestige developed by graduate schools as a sounding-board for doctrines that I believe are untenable, I nevertheless recognize that these presidents are champions of academic freedom and have large responsibilities for their institutions in relation to current public opinion. Perhaps not only the boxer may be allowed to "roll with the punch" in order to stay on his feet.

American scholarship is still struggling with the problem of military security and the restrictions as to freedom of publication and dissemination of information that this places on scientists. We are met here with a genuine problem. Much technical military information must be kept secret for the preservation of our national security. It is conceivable that in some cases the secrecy of basic scientific information is as important as the secrecy of technical information. The problem, therefore, of what information may be published and the

correlative problem of who may have secret information causes real difficulty. There is not only safety but danger in secrecy: a country whose scientific knowledge is carefully guarded may be a country in whose scientific knowledge there is little development. We also must guard against security regulations that are not of real importance to the national safety but are merely administratively convenient to government agencies or are used by these agencies to avoid criticism. Much has been done to bring common sense as well as shrewd analysis into our security regulations. The National Academy, under the leadership of Dr. Bronk, has been particularly effective. So also has been the American Association for the Advancement of Science. In December, 1954, the Board of Directors of the American Association for the Advancement of Science issued a statement. Its introductory paragraph reads as follows:

> Those charged with safeguarding the United States have sought to minimize the danger of internal subversion through the screening of government employees and persons having access to classified information. This program is necessary, but it poses a serious dilemma: the more completely we succeed in reducing the danger that information now in our possession may leak to a potential enemy, the more risk we run of interfering with scientific progress and of reducing the technologic superiority and the moral and physical strength upon which victory in the ultimate test would depend. The inherent dangers of this dilemma can be lessened and our strength enhanced by changing our basic concept of internal security from one that attempts almost exclusively to minimize our losses to one that places greatly increased emphasis on maximizing our gains.

In dealing with this problem I also quote two short excerpts:

> . . . It follows that ability to make positive contributions to the nation's welfare and progress should be a primary criterion of a person's suitability for any position other than positions involving access to the types of information that must properly be closely guarded. We do not find that this criterion is now, in actual practice, the primary one. It is necessary to ask *What security risk is incurred in employing this person?* But it is also vital to ask *What risk of delayed progress or diminished achievement is incurred in not employing him?* . . .
>
> . . . demonstrated disloyalty, or even a strong presumption of disloyalty, is a different matter from security risk. Disloyalty is not to be tolerated anywhere, but stringent security precautions are appropriate only when the information to be guarded justifies the stringency.

At the Annual Meeting in 1954 the Council of the American Association for the Advancement of Science, upon recommendation of the Board of Directors, issued a statement regarding criteria for support of the work of scientific investigators on non-classified subjects by the federal government. It approved a policy where the "appraisal of merit of a proposal is based on the experience, competence, and integrity of the investigator, as judged by a panel of competent scientists who have a working knowledge of his qualifications." The resolution rightly maintained that even if certain groups, including avowed communists and those convicted of crimes involving the nation's security, may be excluded from employment such exclusion should be based upon due process of law.

I turn now to the role of the American Association of University Professors as the investigator of individual cases. When a professor complains to the Association of alleged injustice by the administration of an institution, a preliminary survey of his statements, and usually of statements of the administration, is made. Frequently the case is dropped at this stage. Sometimes adjudication is arrived at. Occasionally there seems to be enough evidence of possible unfortunate practices on the part of the administration to warrant more formal investigation. This is entered into by a committee of professors from other institutions. In many cases it becomes apparent that the blame is more that of the faculty member than that of the administration, or that it is nearly equally divided. I believe that three-fourths of the cases could be avoided by common sense on either side. It would not necessitate common sense on both sides. In some cases, however, it is the judgment of the committee that the administration is largely at fault. These more serious cases are reviewed carefully by the Committee on Academic Freedom and Tenure. Frequently reports of these cases are published. Every effort is made to be fair; success may not always be complete. However, the judgment of such committees is usually considerably more just than that of the participants. It is to the great credit of the administrations of our institutions that in almost all cases where their actions have been sustained, they have not desired publication that would damage the name of the dismissed scholar. The absence of such publication, however, is in part the basis of the opinion that the Association is one-sided.

I believe this process has had a marked and a salutary effect. It has helped to develop the "common law" of academic practice. Although

most college administrators are on the side of the angels, their fear of public opinion may at times exceed their fear of God. It is well for them to be reminded that there is a public opinion of the scholarly world whose commendation or censure is important. Because administrators, governmental or institutional, have the greatest power to restrict freedom, they must be scrutinized with the greatest vigilance. By the same token, much credit for the freedom provided scholarship and teaching in the American university should go to them.

There is an area that needs further analysis in the working out of standards of acceptable procedure. That is in connection with the freedom of a student both as an individual and in his organizations. Some of our most troublesome problems deal with student organizations and the speakers that they bring to our campuses. We should develop recognized standards in regard to these matters as there are standards in regard to the freedom of the teacher and the investigator. It is well to remember that a prime purpose of academic freedom is to assure freedom of learning on the part of the student and that this cannot be guaranteed merely by assuring the freedom of the professor.

In summary, although such organizations as the Association of American Law Schools, in dealing with the questions of the Fifth Amendment and related topics, and the American Association for the Advancement of Science, in its work in regard to secrecy and security, have been of great importance, I believe that the American Association of University Professors has been the greatest single force among the professional organizations in maintaining academic freedom. This force is exerted by the investigation of individual cases and through analysis, in cooperation with other organizations—chiefly the Association of American Colleges, of standards of academic practices.

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OLDER AND NEWER CONCEPTS OF ACADEMIC FREEDOM

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(*Read April 25, 1957, in the Symposium on Academic Freedom*)

IN his article entitled "Academic Freedom: A Decade of Challenge and Clarification" which appeared in the September, 1955, issue of *The Annals of the American Academy of Political and Social Science*, Harry D. Gideonse, President of Brooklyn College, made this wise observation:

> The struggle for academic freedom takes a new form as the intellectual, ideological, and cultural landscape changes. The essence of the tradition must be restated and redefined by every generation in the light of current facts, current challenges, and current abuses . . . freedom is not inherited as a youth acquires property rights in a house from his parents. Freedom can only be inherited in the sense that every succeeding generation has the opportunity to hammer out for itself, on the anvil of its own experience, the framework of unavoidably interwoven right and responsibilities within which freedom in the sense of self-expression and freedom in the sense of self-control can be for such a generation a working faith.

The history of the development of academic freedom substantiates beyond doubt the truth of this statement. Like so many segments of our cultural pattern academic freedom, as the historian Richard Hofstadter points out, dates back to Ancient times.[1]

Not unlike many intellectual movements it made slow progress before the nineteenth century and even then only halting progress in this country prior to the impact of Darwinism and the German conception of a university on American academic thought during the decades after the Civil War.[2]

The fact that no clear-cut formulation of the doctrine of academic freedom had emerged by 1865 admirably illustrates President Gideonse's thesis. The academic atmosphere of the modern university was lacking. In fact, with few exceptions the university as it exists today had not yet appeared. The academic man was only beginning to become professional. The intellectual life of the colleges of the pre-Civil War era had not as yet been profoundly affected by science. The organic relation between institutions of higher learning and community, so pronounced today, were only vaguely foreshadowed by 1865. Most important of all, perhaps, institutions devoted to higher education were still *conservers* of *existing* knowledge and of what was regarded as absolute and possessed truth rather than as *questioners* of *accepted* truth, *searchers* for new knowledge, and *assessors* of prevailing values. The concept of the search for knowledge and truth—not absolute truth but truth as far as existing knowledge permitted would not appear full-fledged for approximately another half century.

The doctrine of academic freedom which emerged in the years prior to World War I was in large measure the product of environmental change. Thanks to the influence of Darwinianism and the German ideal of what a university should be, a veritable educational revolution swept over America which drastically altered the character of higher education in the United States. The older or orthodox doctrine of academic freedom was in large part a product of this revolution.[3]

Even before the middle of the twentieth century it was evident that the older concept of academic freedom was no longer completely adequate to cope with the problems of a rapidly changing situation. New issues, especially communism and how to deal with it, had arisen. The status of student freedom had also moved to the fore. The question of the teacher's freedom both within and without the classroom took on new significance. These and other issues virtually compelled proponents of freedom for the teacher and researcher not only to reexamine the meaning of the doctrine of academic freedom but to broaden the scope of its activating machinery sufficiently to cover issues

[1] Richard Hofstadter and Walter M. Metzger, *The development of academic freedom in the United States*, 3, New York, Columbia Univ. Press, 1955.

[2] For the influence of Darwinism and the German influence on academic freedom in America consult Hofstadter and Metzger, *op. cit.*, 320–412.

[3] For the orthodox doctrine of academic freedom consult Owen O. Lovejoy's authoritative article on academic freedom in the *Encyclopedia of the Social Sciences* 1, New York, 1938; Henry W. Tyler and Edward P. Cheyney, Academic freedom, in *Annals Amer. Acad. Political and Social Science*, November, 1938; Hofstadter and Metzger, *op. cit.*, chaps. VIII, X.

not contemplated by the classical formulation of academic freedom a half century ago. In fact, the last decade has been a period of restatement and redefinition.

Of the several issues recently confronting the advocates of academic freedom none has been more vexing and more provocative of heated debate than communism. This issue first came to the fore in the late thirties, and early forties, in connection with the Rapp-Coudert investigation of public education in the City of New York. The investigation affected not only the public schools but the municipal colleges as well. Dr. Gideonse as the President of one of these institutions—Brooklyn College—and your speaker, as a member of the Board of Higher Education at the time, had ample opportunity to observe first hand practically all phases of the investigation and the degree to which it impinged upon the doctrine of academic freedom. Especially was this true of President Gideonse.[4]

Two diametrically opposed camps of opinion developed over the question of whether a member of the Communist Party, if a teacher, should enjoy the protection of the doctrine of academic freedom. Sidney Hook, an outstanding spokesman of those who say "no," argues in the negative. Membership in the Communist Party is, he maintains, *prima facie* evidence of professional unfitness to teach. In his opinion the communist is not a heretic; he is a conspirator. Teachers who prejudice themselves or engage in scurrilous and anonymous libel of their colleagues are unfit for membership in the teaching profession irrespective of their performance in the classroom or as practitioners elsewhere of their scholarly speciality. Moreover, communists who attempt to conceal their membership in accordance with party instructions are likely, he contends, to use the classroom for recruiting purposes.[5]

Others in this same camp of opinion agree with Hook that rejection of members of the Communist Party as members of the teaching profession is not a matter of ideas but a question of conduct. Thus President Gideonse, speaking not from hearsay but on the basis of observed facts, holds that "it is not morally edifying to hear a plea for the avoidance of relevant testimony by a college professor on high grounds of 'conscience' when the preceding day's testimony clearly and *admittedly* included evidence of perjury by the same individual at an earlier session. These only *appear* to be political issues. They are in fact ethical questions that strike straight at the core of the viability of a free society."[6]

In the opposite camp are those who insist that the acid test is not a teacher's associations, political or otherwise, that should determine, but his professional competence in and out of the classroom. Those in this camp hold that as long as a teacher on his job concerns himself with the task of adding to the sum total of knowledge and the advancement of truth he should, even though he be a communist, have the protection of academic freedom accorded the non-communist. For those in this camp freedom is either unqualified or it does not exist.

Dr. MacIver, who in his volume *Academic Freedom in Our Time* deals with communist issues at considerable length, suggests that the following principles might well guide us in dealing with communism on the campus of our respective institutions:

1. The case against the Party Communist as educator in the United States is primarily based on his relation to political activities of a suppressive or conspiratorial character and not on his economic theories. He should not be restrained or penalized merely because the majority disapproves of his opinions.
2. No college or university educator should be dismissed or disciplined on the ground that he is an ex-communist, a Theoretical Marxist (without Party connections), a socialist or "radical," or a political non-conformist.
3. In view of the charges to which the Communist Party is open, a communist whether he carries a party card or not, may properly be dismissed or disciplined if he injects Communist propaganda into his teaching or into his relationships with students. Conversely, the communist, even the Party member, who teaches a subject such as mathematics or geology, who keeps communism as his private faith, who in all his academic relations refrains from any tendencious statements concerning it, and who, moreover, says nothing to suggest that he personally is amenable to the three charges we make against the Party, could in accordance with the democratic tradition be suffered to hold his job. A democracy that has confidence in itself and in its cause would let him alone.
4. When questions arise concerning the presence of a Communist on the faculty, the proper body

[4] For a detailed study of the impact of communism on one of New York's municipal colleges see T. E. Coulton, *A city college in action*, New York, Harpers, 1955.

[5] Sidney Hook, *Heresy, yes—conspiracy, no*, 186 ff., New York, John Day, 1953.

[6] Harry D. Gideonse, *op. cit.*, 82.

to undertake an investigation of whatever charges are made is the faculty itself, through an appropriate committee. While the final authority is the governing board, that body should pay high respect to faculty judgment on the matter.

5. Any general investigation designed to uncover possible Communists on the faculty is wholly undesirable.
6. The imposition of special loyalty oaths on faculty members, that is, oaths requiring a denial of communist affiliations, is a derogatory, injudicious, and futile expedient.
7. If an organization of college or university students invites a Communist to address them, they should be permitted to hear what he has to say.
8. No student should be debarred or dismissed from any institution of learning because he professes communist ideas.[7]

Personally, I would oppose the nomination for or the appointment to an academic position of a Party communist or any other person who conspires illegally to overthrow the government of the United States. Ex-communists or those unjustly accused of being communists should, in my opinion, not be excluded. Removal of a person accused of being a communist from an academic post should be preceded by faculty investigation and recommendation. Removal should be vested in the governing board of the institution.

There is no issue between the opposing camps of opinion about the importance of teaching about communism or about communist ideas. Both groups deplore the wrong done to innocent persons who have been accused of "guilt by association" and whose reputations and standing in their profession and in their community have been seriously damaged. Incidentally, the communist scare of recent years has been revealing as a yardstick of the intellectuality of a cross section of the American people. To the best of my knowledge no one has as yet compiled a catalogue of the ridiculous and nonsensical actions that have been taken as a supposed safeguard against the communist menace. These range all the way from dropping of texts and collateral readings from the public schools to the severing of lifelong friendships. In one California community a geography text was dropped because its author was regarded as disloyal for having included in terms of area and population a comparison of Russia and the United States and noting that Russia was larger in both respects![8]

[7] Robert M. MacIver, *Academic freedom in our time*, New York, Simon & Schuster, 1955.

[8] See MacIver, *op. cit.*, 172–187.

On the plus side the long and acrimonious debate over communism has resulted in much soul-searching as far as the freedom of the teacher is concerned. In this connection it may be well to compare four explanatory statements about the nature of academic freedom to which the issue of communism has given rise. The first is by Sidney Hook:

> Academic freedom is a specific kind of freedom. It is the freedom of professionally qualified persons to inquire, discover, publish and teach the truth as they see it in the field of their competence, without any control or authority except the control or authority of the rational methods by which truth is established. Insofar as it acknowledges intellectual discipline or restraint from a community of qualified scholars which accepts the authority of rational inquiry it is justified.
>
> Like every other freedom, academic freedom, although it has an intrinsic value, is not absolute. It must be judged by its consequences on a whole cluster of other freedoms (values). The justification of academic freedom must therefore lie in its fruits.[9]

Russell Kirk accepts the statement of W. T. Couch, dismissed as Director of the University of Chicago Press in 1950 that:

> Academic freedom is the principle designed to protect the teacher from hazards that tend to prevent him from meeting his obligations in the pursuit of truth. The obligations of the teacher are direct to truth, and the teacher who in order to please anybody, suppresses important information, or says things he knows are not true, or refrains from saying things that need to be said in the interests of truth, betrays his calling and renders himself unworthy to belong in the company of teachers.

To this Kirk adds that the principle of academic freedom might well include a commitment

> to adhere to the truth, according to the light that is given to the teacher; a promise to conserve the wisdom of our ancestors and to extend the empire of knowledge as best a teacher can; a promise to guide and awaken the student but not to indoctrinate; a promise to abide by the principles of the social order, as expressed in the country's Constitution; and a promise always to put freedom of the mind above material advantage and the passions of the hour. What the Hippocratic oath is to the physician, such an oath ought to be to the teacher, and more; and no further oath ought to be required by an authority.[10]

Robert M. MacIver's statement is somewhat briefer:

[9] Sidney Hook, *op. cit.*, 154.

[10] Russell Kirk, *op. cit.*, 1, 153.

Academic freedom is . . . a right claimed by the accredited educator, as teacher and investigator to interpret his findings and to communicate his conclusions without being subjected to any interference, molestation, or penalization because these conclusions are unacceptable to some constituted authority within or beyond the institution. *Here is the core of the doctrine of academic freedom. It is the freedom of the student within his field of study.*[11]

The fourth pronouncement consists of key paragraphs from a statement unanimously adopted by the Association of American Universities in 1953:

A university must . . . be hospitable to an infinite variety of skills and viewpoints, relying upon open competition among them as the surest safeguard of truth. Its whole spirit requires investigation, criticism and presentation of ideas in an atmosphere of freedom and mutual confidence. This is the real meaning of "academic" freedom. It is essential to the achievement of its ends that the faculty of a university be guaranteed this freedom by its governing board, and that the reasons for the guarantee be understood by the public. To enjoin uniformity of outlook upon a university faculty would put a stop to learning at the source. To censor individual faculty members would put a stop to learning at its outlet. . . .

Timidity must not lead the scholar to stand silent when he ought to speak, particularly in the field of his competence. In matters of conscience and when he has truth to proclaim the scholar has no obligation to be silent in the face of popular disapproval. Some of the great passages in the history of truth have involved the open challenge of popular prejudice in times of tension such as those in which we live. . . .

Appointment to a university position and retention after appointment require not only professional competence but involve the affirmative obligation of being diligent and loyal in citizenship. Above all, a scholar must have integrity and independence. This renders impossible adherence to such a regime as that of Russia and its satellites. No person who accepts or advocates such principles and methods has any place in a university. Since present membership in the Communist party requires the acceptance of these principles and methods, such membership extinguishes the right to a university position. . . .

"Academic Freedom" is not a shield for those who break the law. Universities must cooperate fully with law-enforcement officers whose duty requires them to prosecute those charged with offenses. Under a well established American principle, their innocence is to be assumed until they have been convicted, under due process, in a court of proper jurisdiction.

Unless a faculty member violates a law, however, his discipline or discharge is a university responsibility and should not be assumed by political authority. Discipline on the basis of irresponsible accusations or suspicion can never be condoned. It is as damaging to the public welfare as it is to academic integrity. The university is competent to establish a tribunal to determine the facts and fairly judge the nature and degree of any trespass upon academic integrity, as well as to determine the penalty such trespass merits.[12]

These four statements indicate with great clarity the extent to which the older concept of academic freedom has been broadened to meet new conditions. They also indicate a wide range of agreement on the essential principles espoused by the AAUP in recent years.

Did time permit it would be fruitful to explore some of the more important opportunities for the further enhancement of man's essential commitments under the doctrine of academic freedom.

[11] Robert M. MacIver, *Academic freedom in our time*, 6, New York, 1955.

[12] For complete statement see Association of American Universities, *The rights and responsibilities of universities and their faculties;* a statement adopted Tuesday, March 24, 1953.

THE ROLE OF THE ADMINISTRATOR AS GUARDIAN OF ACADEMIC FREEDOM

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(*Read April 25, 1957, in the Symposium on Academic Freedom*)

In the first place, to be a guardian of academic freedom the administrator must understand freedom and he must understand education. Unless he understands both he is unlikely to help either.

By understanding freedom I mean understanding the fact that it is the center of the political philosophy and the political practice of a society organized on democratic lines. An administrator who is able to create situations in which people feel free to do their best work—and this I believe to be what an educational administrator should be doing—has to know enough about the history of freedom to realize that this is the prize most often sought by intellectuals and the hardest one to win. The administrator also has to know that the mere forms of academic freedom—tenure rules, committee review, commencement speeches, and so on—are not necessarily productive ways of ensuring freedom. Ultimately, freedom for a member of a college faculty is a state of mind, a matter of his feelings and his personal life. So much of our talk about academic freedom is negative. It has to do with defending freedom from attack, making rules for administrators and teachers to follow, laying down conditions for support and retention of faculty members. The negative aspect is implied in the title of the topic assigned to me today—The Role of the Administrator As the Guardian of Academic Freedom. I would like to think that the word is used in the old sense of Guardian of the King, or Guardian of the Sacred Word, not guardian as in the case of a ward, or as a legal substitute for the real parents of a defenseless child. It is too often the latter definition which is implied when people speak of guarding freedom.

To me the educator is the creator of freedom, and only in this sense its guardian. He guards it best by trying to make more of it happen, otherwise he is likely to become defensive in his defense of it. Freedom is like love or loyalty. It has to have a positive, outgoing, intuitive element to be meaningful for the person who has it, and what we call the morale of college faculties is built upon whether they feel not only that they will not be dismissed or punished for saying whatever they think, but whether they feel that the institution they serve wants them to say what they think, and wants them to think up more things to say.

Until the administrator understands that freedom in a university is a question of how the faculty members feel, as well as what they are or are not allowed to do, he is not in a position to guard it successfully. The people who attack the freedom of university scholars can be successful in removing freedom without actually winning a legal victory merely by hammering away from year to year at the opinions expressed by faculty members and finding that the institution to which the scholars belong feels no responsibility for supporting its own members. Like so many things in a democratic society, the question of whether an idea or a project is warmly accepted or meanly rejected is a matter of the atmosphere into which the idea or project is put. Senator McCarthy won an almost total victory by his subversive activities against the universities, since he succeeded in demonstrating to the world that the leaders of a democratic society had no principle except that of accommodation to deal with slander, gossip, lies, and plain bullying. The only reason Senator McCarthy did not gain a total victory over the whole of the American government and the whole of the American university system was that (1) he went too far and turned out not to be as shrewd, powerful, or intelligent as people thought he was, and (2) a very small group of people in public life and in the universities stood firm on the principles of freedom and refused to compromise them or to yield to public pressure.

All this is involved in understanding freedom. The understanding must have dimensions in the real world of action, it must be based on study, study of history, of philosophy, of literature, of art, and it also must be based on knowledge of cases and direct experience of the way the American social system works. In other words the educational administrator should be an educated man.

How many university administrators actually

attended hearings before the Senate Committees which investigated faculty members? How many deans and college presidents read the transcripts of the McCarthy, Jenner, and Velde committees at the time of their investigations of intellectuals? How many educators know even now the procedures followed by the committee staffs and committee counsels in collecting gossip, American Legion press clippings, reports from former FBI agents, unevaluated material from the Justice Department, statements from former Communists who are either known to be liars or to have great powers of free association? How many educators know the public relations techniques used by Senators intent on gaining political opportunity and power by building a reputation through newspaper stories about their investigations? How many realize that these reputations are built at the expense of newspapermen, teachers, scholars, and intellectuals who have been convicted of no crime and are accused of nothing more than association in political activity which was both legal and permissible at the time they engaged in it?

In order to understand freedom as it works in the everyday life of American society, and thus to achieve competence in guarding it, it is not enough for the college president to be affable to alumni, businesslike with Board members, gracious with faculty members, and capable of quoting John Stuart Mill on public occasions. The administrator must understand both the issues and the strategy, the attackers and the defenders. It was the innocence of university officials in matters of practical social fact which made possible the kind of statements made in the report of the Academic Freedom Committee of the Association of American Colleges during the middle of the McCarthy era to the effect that there were no problems and that the universities welcomed investigation. The same kind of innocence was displayed by the Association of American Universities when that body of educational administrators admonished faculty members to speak freely of their private political beliefs and activities before Congressional committees, at the same time giving no indication of how the universities would support a man who thus spoke so freely.

That document has its analogy in the story of the boxer who came back to his corner feeling battered after a round of fighting. His trainer clapped him on the back and said, "Atta boy. He hasn't laid a glove on you."

To which the fighter replied, "Great. Would you mind keeping your eye on the referee? Somebody out there is knocking me stiff."

In my view the proper attitude for the administrator to take is the one set down by Alexander Meiklejohn in his inaugural address as President of Amherst in 1912.

> The function of a teacher is to stand before his pupils and before the community at large as the intellectual leader of his time. If he is not able to take this leadership, he is not worthy of his calling. If the leadership is taken from him and given to others, then the very foundations of the scheme of instruction are shaken. . . .

Because the educators did not exercise this responsibility of leadership, it was taken from them by the Congressional committees, and the foundations of the scheme of instruction *were* shaken. It is in the acceptance of responsibility for intellectual leadership that teachers and administrators have their true mission. The teacher who pays no attention to the need of his colleagues for public support when they are under attack, the president who does not take seriously the need for leadership in supporting and explaining to the public the principles of academic freedom when they are challenged, are alike failing their obligations as educators.

There is only one principle according to which a teacher or a scholar should be judged when his faculty membership is questioned by political investigators—the principle of integrity in scholarship and teaching. As soon as we depart from standards applicable to all scholars and teachers in the proper exercise of their duties, we open the door to special criteria of judgment pressed upon us by those who are unfamiliar with the delicate process by which truth is found and intellectual honesty is determined. The work of the teacher and the scholar is to be judged, in the community of scholars, by the quality of his evidence, the sincerity of his convictions, the honesty of his mind, and the wisdom he shows in drawing his conclusions. There are professional standards applicable to scholars and teachers just as there are in the case of lawyers, doctors, architects, or engineers.

When political criteria and public pressure of any kind, no matter how sincere and well intended, are applied to this principle, an immediate conflict of judgment occurs. The political pressure seems justified to the public, since the public is already prepared to be suspicious of political deviation. The real distinction is to be made between those who are political deviants and those who are disloyal to the principles of free inquiry and to their country. Political deviation and disloyalty are two different things and can be dis-

tinguished from each other in individual cases only by the use of informed judgment and the laws of evidence.

It is on this question that the most serious issues in the protection of freedom for teachers have turned, and it is because disloyalty and political deviation have become equated that the freedom itself is in serious danger.

It is here that the administrator has his prime duty as guardian of freedom for his teachers. He must insist that no matter how great the public pressures or how violent the public objections, the regular procedures of faculty judgment must be applied. The question of political opinion and affiliation must be kept subordinate to the question of the integrity of the scholar and the teacher as revealed in his work and as judged by his colleagues. The question of whether a faculty member should be retained or dismissed is one which can only be answered by the institution itself through its faculty procedures. The responsibility of the administrator is to make certain that the pressures of public opinion and outside forces do not affect adversely the quality of the judgments made by the institution.

One difficulty in achieving these ends is that the university administrator is very often not himself a scholar or a teacher. The administration of colleges and universities has become so complex a problem in finance and personnel that governing boards have often sought, in their appointments to the presidency, the services of men with business and administrative records, and, in many instances, have not considered scholarship or educational experience essential to the post. The governing boards, composed of businessmen, industrial executives, lawyers, or political appointees of the state, incorporated by charter to control education, now frequently act in the manner of corporation executives employing an executive officer. The president is employed to administer funds set aside to hire a staff of experts to instruct young Americans in the proper professional skills, intellectual and social habits, and academic folklore of American society. Qualities of scholarship, learning, and humanity are not considered relevant to this task, and in some cases are considered hindrances. What is said to be required is sound business sense, good public presence, a talent for never annoying anyone, and a reputation for political and social respectability. In special cases it is considered necessary for the president to have been very well known by the general public for work in a field which has no connection at all with education.

So much has come to depend on the financial success of the university that it is impossible for a college or university to advance in its proper work without a continuous and efficient program of money raising and a continuous series of projects designed to increase the annual income. This has now come to be accepted as a major responsibility for the president. Many of our American universities have become institutions in which the academic, student, and employee affairs are conducted by autonomous vice-presidents and deans, who, since they deal with day-to-day policy making, are more directly in touch with the university than the president.

This would perhaps be less serious if administration by vice-presidents were confined to business matters. But often the educational policies are administered entirely by the president's assistants, and the new kind of president, a man who has not grown up in the hard world of faculty controversy, and the hopeful world of faculty planning, is shut away from the knowledge he must have if he is to decide most of the important issues which finally come to him. With the internal life of the university in the hands of assistants, deans, and departmental chairmen, and the external life directed by the pressures of trustee, legislative, alumni, and public bodies, the president then may come to occupy the position of a very expensive office boy, for his university and for his society.

It is often said, in justification of the manager-president, that his skill in public relations, fund raising, business management, and general administration is needed so that the university can gain the financial backing it must have for the improvement of educational quality. This argument contains a dangerous fallacy in its separation of financial policy making from educational leadership. The former can control or destroy the latter. The administrator of a business organization can move from a post in making rubber tires to one involving plastic cups without endangering the new business he is entering, since there are experts who can be employed to advise him on production, and the public relations and promotion of a product follow a familiar pattern.

In the case of education, so much depends upon the philosophy and knowledge of those responsible for decisions that the college administrator who is ignorant of the processes and subtleties of the educational system itself has no clue to the kind of advice he should be seeking, to the kind of expert he should be employing, or to the fact that he is dealing not with a product but with a process.

The college president who is in fact an educator is not employed by a board of directors to carry out their wishes and demands. Nor is he the servant of the alumni who, in the mind of a recent alumnus of Yale University, should have the responsibility and power of a group of stockholders who should control policy and who should vote as stockholders to grant or withhold funds. The graduates of a college are those who have received its benefits and privileges for a sum of money vastly below the cost to the university, and who owe it their support and understanding, as well as their informed criticism. Neither they, nor the general public, nor any organized group in it, may dictate what should be taught and who should teach.

Nor is the college president the servant of the government, responsible for fitting an educational policy, whether about politics, economics, foreign policy, or religion, to the demands of politicians and government authority. His responsibility is to the Constitution of the United States, to the laws of the country, to the charter of his institution, and to the freedom of students, faculty, and citizens to speak, write, and think the truth they find in their own experience. He is a member of a community of scholars whose task it is to keep alive the ideals and practices of a free society by the exercise of authority granted to him by a board of trustees.

The president has the responsibility of acting as an educator for the board itself, and of presenting issues for discussion and decision in such a way that the educational principles are clear and the lines of authority marked. He must act on educational matters as a representative of education, scholarship, and the teaching faculty. When his authority as an educator is challenged in an issue where his educational principles and those of his faculty are at stake, he must hold to his principles at whatever cost to his position as president. Otherwise there remains no principle on which educational policy can be made.

Educational policy can be made satisfactorily only when there is a genuine understanding on the part of boards of trustees or regents as to the true function of a university in a democratic society, and of the way in which that function is fulfilled. In order to carry out its mission, a university *must* operate with rules set by the academic community, and not by doctrines imposed from a board of governors. Otherwise, the university is rendered impotent in the area of its own creative growth. The function of the university trustee is to act as the mediating instrument between the university and its society. The trustee exists, as does the university president, to make available to society the contributions of the scholar and teacher.

In matters of academic freedom, the colleges and universities themselves have a serious obligation toward their faculty members, an obligation which some have shirked. In certain cases, colleges have made refusal to testify fully before a Congressional committee grounds for automatic dismissal, thereby creating the assumption that educational policy is in the hands of the government and not in the hands of the university or the citizen. Such policy creates the presumption of guilt of some kind, incompetence, or moral failure, whereas, both in courts of law and in the academic community the presumption must be one of innocence in the absence of evidence to the contrary.

The statement made in March, 1953, by the Association of American Universities presents the general position of some of the most important private and public universities of the country in the matter of the responsibility of the universities for the freedom of their faculty members. The statement leads to the conclusion that the university presidents who stated the general view of their universities felt themselves to be on the defensive for their institutions, and that they accepted the presumption of Congress that educational policy and the limits of intellectual freedom can be set by the government and not by the citizens and their universities. In referring to a line at which freedom begins to be qualified by duty and obligation, the presidents point to the fact that the line itself is set by legislation and by the courts.

> However much the location of the line may be criticized, it cannot be disregarded with impunity. Any member of a university who crosses the duly established line is not excused by the fact that he believes the line ill-drawn. When the speech, writing, or other actions of a member of a faculty exceed lawful limits, he is subject to the same penalties as other persons. In addition, he may lose his university status.[1]

I am not sure what would be the decision of a constitutional lawyer about this view of freedom of "speech, writing or other actions," but by faculty members it has been interpreted to mean that the presidents are warning their faculty members to be careful not to say, think, or write any-

[1] *The rights and responsibilities of universities and their faculties*, Statement issued March 30, 1953, by the Association of American Universities.

thing making radical suggestions for changing the structure of American society or its government. If it does not mean this, then it must mean simply that the faculty member has the same rights and responsibilities as all other citizens and must take responsibility for his acts and opinions under the law, a point which is not at issue. But one responsibility which the scholar-citizen has and one which the statement does not mention is resistance to the government and non-cooperation with it when he thinks his government is mistaken. How else have changes in government policy come about? How else can we keep the government as servants and representatives of the citizens and mindful of the citizens' welfare?

When placed together with another admonition later in the document, the first warning combines with a second to indicate that the presidents have, as do the Congressional committees, their own image of political orthodoxy for the proper college faculty member. Referring to the fact that universities owe their existence to legislative acts and public charters, the document states:

> Legislative bodies from time to time may scrutinize these benefits and privileges. It is clearly the duty of universities and their members to cooperate in official inquiries directed to those ends. When the powers of legislative inquiry are abused, the remedy does not lie in non-cooperation or defiance; it is to be sought through the normal channels of informed public opinion.[2]

One of the Congressional committees quite rightly took this to mean the approval of its investigation by the universities and inserted the statement into its record of the hearings. Again, the presumption is made that the citizens and the universities are obliged to justify their own legitimate educational policies before their government. "Academic freedom," the statement goes on to say, "is not a shield for those who break the law. Universities must cooperate fully with law enforcement officers whose duty requires them to prosecute those charged with offenses,"[3] and "Unless a faculty member violates a law, however, his discipline or discharge is a university responsibility and should not be assumed by political authority."[4]

There is thus an additional presumption that the Congressional investigations are designed to scrutinize the benefits and privileges of the universities. Not even the committees themselves have made this claim. I know of no faculty member who has ever claimed the protection of academic freedom as a shield for breaking the law, and, although it is true that any university must cooperate fully with law enforcement officers in the event that a member of its faculty does break the law, this is not the issue in the present instance. The issue is, what kind and degree of protection should the universities provide for a faculty member who is ordered to answer all questions about his political opinions and associations and who exercises his right not to do so? No faculty member could take much comfort from the kind of protection offered to him by the university presidents if his freedom under the law were being violated by public attackers.

What would give him more comfort would be a statement to the effect that as a respected member of a university faculty, in the exercise of his lawful right to refuse testimony against himself before a Congressional committee, he is entitled to the support and protection of his university until such time as the evidence produced in a committee of his professional peers should prove that he is no longer worthy of the respect of his institution or a post among its members. The faculty member does not have the resources, the time, energy, money, or public relations facilities to seek remedy for the abuse of legislative powers of inquiry through the normal channels of informed public opinion. Nor does he in every instance have the kind of forthright temperament and sanguine disposition which would make him welcome an opportunity to test the powers or judicial wisdom of Congress in a court of law, or even to reveal his private opinions, personal history, and political associations to a Congressional committee, to the newspapers, and to the country.

The faculty member who looks to his colleagues among the university presidents for common cause in the matter of intellectual and political freedom has felt less secure rather than more so after such admonitions to think freely while being careful not to go too far, and after such faint support for his constitutional rights. One can only hope that a full reading of the record of the open hearings of the Congressional investigations of the colleges in order to catch the flavor, quality, intent, and style of the inquiries may persuade the university presidents to restate the issue in terms more helpful to the faculty members who are called upon to represent American education and American freedom to their students, to the public, and to the world.

[2] *Ibid.*, Section III, paragraph 7.
[3] *Ibid.*, Section IV, paragraph 4.
[4] *Ibid.*, Section IV, paragraph 4.

THE RIGHTS AND OBLIGATIONS OF THE SCHOLAR

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IN PRESENTING this topic I feel I am addressing the wrong audience. It is certainly the outside public who need to be informed about the rights of the scholar, and this select and scholarly audience hardly need to be reminded of his obligations.

When we attribute to the scholar particular obligations and rights, other than those that apply to citizens in general, we are in effect asserting that the function he performs in and for his society makes special demands on him and requires special conditions in order that these demands may be met.

It is sometimes objected, occasionally by people who ought to know better, that to claim any distinctive rights for the scholar is to ask prerogatives and immunities for a gild, exempting its members from certain obligations of other citizens. This assertion confuses mere privileges, such as might be possessed by a social order in a class society, with the rights that are the correlative of functional obligations. The rights the scholar needs are not licenses of any sort, not privileges that others should be denied, but the simple requirements that the pursuit and the impartation of knowledge involve.

The fact that the objection is raised at all is one of the many indications that the scholar's function in society and indeed the intrinsic meaning and worth of education and of scholarly research are most inadequately understood by the people of this country. No one, on the other hand, would deny that the clergyman, the lawyer, the doctor, the civil servant, even the statesman, possess certain rights and incur certain obligations by virtue of their distinctive roles.

In this review we shall limit our consideration to the scholar as a member of an institution of learning, but with the implication that the same rights and obligations are, so far as relevant, applicable to the freelance scholar or to the student-scholar or to the scholar who fulfills a scholarly function under the aegis of other organizations than the academic.

Neither the rights nor the corresponding obligations of the scholar are specifically safe-guarded by legal enactments and constitutional rulings. For the most part they cannot be. If they are to be upheld they must be a primary concern of the academy itself, of the corporate fellowship of scholars, but beyond that the community must itself be imbued with a genuine respect for educational values. Where this respect is inadequate or where, as is the tendency in this country, education is esteemed predominantly for its utilitarian values, as the avenue to careers or as the promoter of technological advance, the academy is insecure and the integrity of learning is skewed by powerful influences.

The impact of the community on the character of the institution of higher learning appears to be greater among ourselves than in other democratic countries, though it is approached in certain countries, such as Australia, where some similar conditions prevail. These conditions include the following: the existence of a highly vocal mass public opinion, the effective organization of a considerable variety of special interests, and the system of college and university government that assigns the final legal authority to boards composed mainly or entirely of non-educators. Under such conditions the liberty of scholarship is unattainable unless the tradition of academic freedom is rooted in the society. This tradition is peculiarly necessary in areas where the leading universities are state or municipal institutions. For these institutions lack the degree of self-protection private or endowed universities possess. The latter have, in the first place, greater powers of resistance to attacks on their integrity that emanate from clamorous organizations or from headline-seeking politicians or, say, a certain type of congressional committee. In our own country the foremost endowed universities have in this respect set a notable example. Whereas state institutions are not only more exposed to the currents of public opinion but also face the additional

hazard that their budgets may be adversely affected by the attitude of some disgruntled lobby.

When we presently review the rights and obligations in question it will become evident that the first line of defense must always be the vigilance of the academic fellowship. To it falls not only the task of resisting and protesting against actual encroachments but also the major share in the education of the public concerning the fundamental values that depend on the freedom of teaching and of learning. In passing, one might suggest that the presidents of institutions of learning, who so frequently are called on to deliver addresses to non-academic groups, might devote more time and eloquence to the enlightenment of the people on this subject, and not in those brave generalities that wring no one's withers but with chapter and verse, realistically pointing out the dangers that beset the integrity of learning and the social and spiritual values that are at stake.

Where else can we look for leadership if the academic institution fails us? The democratic liberty of speech does not, except by broad implication, hew to the line of the scholar's need. Legal enactments and constitutional decisions have been applied to certain situations involving the scholar, but usually on grounds that concern broadly the employer-employee situation, mostly questions of arbitrary dismissal or dismissal on unfounded charges. With the present-day zeal for the unearthing of "subversives" in educational institutions, Supreme Court rulings, both federal and state, have taken on an increased importance. A signal example is the recent Slochower case, in which on a 5–4 decision the U. S. Supreme Court denied the right of the New York City Board of Higher Education, acting under a section of the City Charter, to discharge a professor as an automatic consequence of his resorting to the Fifth Amendment, when questioned concerning his earlier communist affiliations. The immediate sequel to the case illustrates, however, the limitations of judicial decisions in the academic field. The relation of a professor to his Board or other academic authority is something more than or something different from the usual employer-employee relationship. We shall not pursue this subject, though it deserves to be explored. Here we merely point out that in the case cited new charges were at once raised against the professor in question, in order to defeat his reinstatement.

In the light of these considerations let us endeavor to review the rights and obligations of the scholar, what respectively he must demand from his society and what in turn he must demand from himself, if he is to be loyal to the high functions he fulfills for his institutions, for his society, and for mankind. His rights are no more than the freedoms requisite for the fulfillment of his obligations. His obligations are, therefore, not to be thought of in the way men usually think of certain civic obligations. It is our obligation, for example, to report our income faithfully and pay the tax incurred. But no one, or only an exceedingly rare one, does so with any zest for the performance. It is our obligation, sometimes, to attend administrative committee meetings when we would much rather be doing something else. But the major obligations of the scholar certainly do not, or emphatically should not, fall into any such category. The genuine scholar is of the breed of Chaucer's clerk of Oxenford,

> Gladly would he learn and gladly teach.

The major obligations of the scholar merely spell out the ways in which he exercises the full freedom of the spirit of learning.

We shall accordingly signify his rights by reference to the restraints to which he should not be subjected and his obligations by pointing to the positive implications of the rights he must claim.

The rights of the scholar are invaded when, within the institution of learning, policies and programs that call for his professional competence are decided for him by non-scholars—when, for example, faculty nominations for new appointments are overruled, when a faculty member is dismissed without faculty consultation or against the consensus of his faculty colleagues, when curriculum changes or admission standards are made from above without faculty approval, when books are stricken from college reading lists because a Board member or an outside organization protests against them. It is elementary that the medical profession has the responsibility of making decisions on essentially medical problems, and similarly for the legal profession or, say, for the church. But the scholarly profession is in this country not infrequently ignored or at least overridden concerning matters that clearly fall within its field. While the boards of the most distinguished universities observe a due respect for the scholar's rights in this crucial respect, a large number of others are in varying degrees less scrupulous, and some, including a few large state universities, have been flagrantly disregardful of them.

Such violations of the rights of the scholar are committed not only by certain governing boards, as well as, in a more disguised form, by political bodies but also, it may happen, by administrators within the academy itself. They may be committed by a dean or other official, or by the president of the institution. The presidency of an American college or university is a most interesting and rather peculiar phenomenon. He may be a distinguished scholar, he may be a faculty member who is selected not for his scholarly distinction or even his executive capacities, but because he is regarded by higher authority as eminently safe and sound, or he may have no pretensions to scholarship whatsoever, being appointed for services rendered in some other field. He is the intermediary between faculty and board, sometimes the only nexus between them. Much depends on whether he identifies himself with the world of scholarship or with the world of affairs. In the latter event he may not only cease to represent his faculty, he may even, in times of trouble, take the lead in the gross violation of their rights. How else can we describe, for example, the action of the president of an Eastern state university who dismissed a faculty member, in line with the ideas of his board, against the strong opposition of a practically unanimous faculty, or that of a mid-Western university president who promoted a board ukase that every questionnaire issued by any staff member must be approved by himself, or that of another university president from further West, who secured the dismissal of a professor of botany because the latter led a protest against a board policy that lowered the admission standards of the institution?

The dismissal of a professor for his defense of educational standards against administrative policies represents a particularly flagrant violation of the scholar's rights. There are, however, many less obvious violations arising out of the conditions of the scholar's employment.

The occupation of the professor has many advantages, but no one would list the monetary return as one of them. As some offset he enjoys, when he makes the grade, a certain security of tenure, and in most institutions he has a strong expectation of passing in due course through the stages of assistant professor and associate professor to full professor. But tenure in the first instance and promotion in the second depend on the recommendation of superiors. No one can say how often candidates are by-passed not because their ability or their achievement or their teaching capacity is inferior but because someone in a higher echelon dislikes their points of view or their conclusions or objects to them on some other academically irrelevant ground. Here the violation of the scholar's rights hardly ever comes into the open, since it is practically impossible to prove it. But anyone who has had a lengthy experience of academic life must have known or heard of cases where a superior candidate has been rejected because his department head wants yea-men or because someone in the line of hierarchy dislikes his economics or his politics.

No one has an intrinsic right to be selected for any position. It is for the qualified faculty members to assess the relevant factors in making their selection. But it is surely a violation of right when scholarly superiority is made secondary to considerations that have little or nothing to do with the demands of the service to be rendered. Someone has failed to meet his obligation, and someone, or perhaps the institution as a whole, is thereby wronged. In the same context it is necessary nowadays to point out that the scholar's right is violated when any body of non-scholars arrogates to itself the function of determining the fitness of a particular scholar to occupy a faculty position. The perfervid hunt for "subversives" has led boards, state legislatures, and other bodies to take on themselves this function. To the present writer such action is an invasion of faculty rights. It may be granted that any responsible party is entitled to raise the question of a scholar's fitness, but the decision properly lies with his faculty colleagues. To presume otherwise is to cast doubts on the integrity of the faculty itself. And it takes the power of decision away from the body that alone has the intimate knowledge of the case and at the same time is more likely to use its discretion without being affected by public clamors or political opportunism.

Finally, let us observe that these functional or professional rights of the scholar do not diminish his general rights as a citizen. He has certainly no prerogative to use his classroom as a sounding-board for deliverances on all and sundry subjects, but he should be in no way precluded, outside the classroom, from making public statements on controversial subjects. In some quarters the idea prevails that a scholar somehow implicates his university when he expresses his own opinion in public—a most quaint notion of what a university means. Even more quaint is the notion, trumpeted in a book that damned a great university, that the scholar, in his intramural discourses,

should confine himself to the "facts" and not draw any conclusions not absolutely "verified" by the facts. This doctrine would turn the scholar into a kind of intellectual eunuch. As every scholar knows, or should know, the great scientific advances have never come from a simple reading of the facts but from the imaginative play upon them of the trained mind, expressed in hypotheses, inferences, suggestions, and hunches.

As for the obligations of the scholar, are they not easy enough to sum up? Do they not amount simply to the requirement that he be faithful to his trust as a seeker after knowledge, knowledge in its amplest sense, which at the further margin widens into wisdom, and that he impart his knowledge with the same faithfulness with which it must be sought?

More specifically, he is called on to be thoroughly scrupulous in his respect for evidence, and most of all for such evidence as may appear to be out of accord with his point of view or his doctrine or his interest. At the same time he must give fair and open-minded consideration to the arguments of those who reach different conclusions from his own. He must not yield to the temptation to magnify his conclusions, to overstate his evidences, to announce certainty where he has only some degree of probability, or, say, to claim credit for discoveries that belong as much to his co-workers as to himself. In a world where the fine art of propagandism is supreme, he must set a somewhat lone example, if he propagandizes at all, by avoiding all distortion of either side of the case.

Furthermore, his obligation as a teacher requires that he be more concerned to have his students think for themselves than to enroll them as his disciples, nor must he in his recommendations show any partiality for less qualified scholars because they belong to his own school of thought. And he must be on his guard lest he temper or modify or soft-pedal his findings, in order to placate some authority, nor should he take refuge in the pious conclusion that there is much to be said on both sides, when he is convinced that there is more to be said on one side than on the other. Let us not forget that the scholar, if he is not to become an industrious nonentity or a mere peddler of others' wares, must interpret as well as seek for evidences, and that, whether his field be physics or history or economics or literature or anything else, he must deal with probabilities and leads and indications and inferences, a long way short of the certainty we often think of as the scholar's goal.

At the outset it was suggested that the obligations of the scholar are in effect the conditions requisite for the all-round advancement of scholarship itself. The obligations of scholarship and its objectives coincide. At the same time the scholar, being as human as other men, is subject to the particular ambitions, rivalries, vanities, foibles, and oversights that tempt him to relax, here or there, consciously or unconsciously, the constant integrity the pursuit of knowledge demands. Finally, there remains one obligation of the scholar of which, as considerable evidence shows, he seriously needs to be reminded. It is that he rally to the defense of academic freedom when it is endangered by attacks on his fellow scholars, whether in other institutions or in his own. With a public that is still so uneducated to the essential worth of learning, with certain political figures still making capital on this score, in a world where propaganda has myriad voices and the spirit of truth how few, there is needed a greater solidarity of scholarship, not contented to make a few defensive gestures, but ready to combat every encroachment on its proper freedom.

A HOUSEHOLD INVENTORY, 1581

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ONE of the most valuable sources for the biographer, Shakespearian scholar, and social historian of the sixteenth century is the household inventory. The inventory was simply an account of the goods, chattels, and lands found in the possession of a person at the time of his death. Such listings were usually prescribed in the will of the deceased to facilitate a proper settlement of the estate. After the compilation of goods, the overseers of the estate presented the inventory, as required, to an ordinary and swore to its validity. One copy was deposited with the court while the other was retained by the executor of the will. The appraisals were not binding; consequently, inventories were not held in very high regard by common law courts.

The present inventory [1] is significant because it records the estate of a prominent Tudor personage, Dr. Thomas Wilson (1523?–1581).[2] Humanist author of treatises on logic, rhetoric, and usury, and translator of Demosthenes, Wilson achieved considerable recognition as master of requests, member of parliament, ambassador, privy councilor, and principal secretary during the reign of Elizabeth.[3] When Wilson died in May, 1581, he was about fifty-eight years old. Twice married,[4] he had outlived both his spouses. He had by his first wife three children, two girls and a boy, all of whom were still under age at the time of his death. Obviously concerned for their welfare, he prepared a will the day before he died.[5] He appointed overseers—his friend and colleague Sir Francis Walsingham; his brother-in-law and children's uncle, the admiral Sir William Winter; and a cousin Mathew Smith—and directed them to look to his affairs and estate after death. His body, the good puritan stipulated, should be buried "without charge or pomp" at St. Katharine's Hospital where he had served as master for twenty years.[6] His daughters Mary and Lucrece were to receive 500 marks upon marriage or at the age of twenty-one, whichever came first; his son Nicholas he named sole executor and heir. A third of his Lincolnshire lands Wilson gave to the overseers for five years to implement the execution of his will. His estate at Edmonton in Middlesex and his plate he ordered sold to pay his debts. The overseers, in order to comply with the deceased's last wishes, directed the compilation of the inventory appended. The separate items and their estimated worth were recorded on narrow sheets

[1] The author wishes to thank the Reverend Sir G. Percy M. Maryon-Wilson, Bt., Christ Church Rectory, St. Leonard-on-Sea, Sussex for permission to reproduce the inventory; Mr. G. Reeves for his assistance in locating the document; and Mr. Francis W. Steer, county archivist of Sussex and authority on inventories, for his aid in editing it. The inventory is presently located at the Estate House, Old Charlton, Kent.

[2] In his article in *Dictionary of National Biography* **21**: 603–607, Pollard concluded Wilson's birth year to be 1525 (?), but two documents point to 1523. *Cf.* King's College Protocullum Book, **1**: 104 and Public Record Office Town Depositions, C. 24/30. Wilson died on May 20, 1581 instead of June 16 as indicated in *D.N.B.* *Cf.* P.R.O. Inquisitions Post Mortem, C 142/233, no. 41, 34 Eliz. and P.R.O. Court of Wards, 7/23, no. 112, 34 Eliz.

[3] Wilson is best known as civic humanist for his *Rule of reason* (1551), *Arte of rhetorique* (1553), and *A discourse upon usurye* (1572). The best authority on Wilson as a rhetorician was the late Russell Wagner of the University of Virginia. I have dealt with Wilson's private life in: Thomas Wilson, Tudor scholar-statesman, *Huntington Library Quarterly* **20**: 205–218, 1957, and with his official life in: A treatise on England's perils, 1578, *Archiv für Reformationsgeschichte* **46**: 243–249, 1955.

[4] Wilson's family life has been much misunderstood. Shortly after his return from Italy (where he resided and was imprisoned during Mary Tudor's reign) in 1560 he married a widow, Agnes Brook, the sister of the merchant and admiral, Sir William Winter. She, who mothered all his children before 1565, died in June, 1574 (London Guildhall MSS, 4546, Regis. of Christenings and Burials, St. Mary-at-Hill, 1560–1812). In 1576 Wilson married Jane Pinchon, widow of John Pinchon of Writtle, Essex. In contradiction to the old genealogies I may say that Jane was the daughter of Richard Empson of London and the granddaughter (not daughter) of Henry VII's minister (*cf. Letters and Papers* of Henry VIII, 1538, **13**: Pt. i, no. 190/24; Prerogative Court of Canterbury Wills, Richard Empson, 1556, 10 Ketchyn). Jane, whose possessions are mentioned on the last page of the inventory, died about 1579.

[5] *Cf.* P.C.C.W., Thomas Wilson, 1581, 32 Tirwhite.

[6] The best account of Wilson at St. Katharine's is Catherine Jamison, *The history of the royal hospital of St. Katharine by the Tower of London*, London, Oxford University Press, 1952.

of parchment which when sewed together extended to approximately forty feet.

Wilson's inventory, which dealt with his estate called Pymnes[7] in Edmonton, is significant both for what it contained and for what it lacked. Some estimate of the master's social status, wealth, and taste might be obtained by perusal of the properties, perquisities, linens, furnishings, and apparel listed. The omissions from the inventory were notable. Except for the ewer and basin there was no mention of plate which certainly did exist. Few jewels were listed, and these Wilson possessed, too. The absence of a library is especially disappointing since Wilson was a scholar of repute. Obviously missing was women's clothing: neither of his wives had lived at Edmonton.

In transcribing the inventory the editor has taken several liberties in order to facilitate its reproduction. The word "Item," which appeared before each article listed, has been omitted. The monetary symbols have been placed at the top of each column rather than next to each figure as in the original. The inventory appears below in its original orthography.

[7] Wilson purchased Pymnes from one Nicholas Rodelsby, gent., in the spring of 1579 for £300 (P.R.O. Close Rolls, C 54/1052). During the summer following he bought additional land adjacent to the estate for £40 (P.R.O. Feet of Fines, CP 25 (2) 172, 21 Eliz. Trinity). There is no evidence in Edmonton today of Wilson's ownership of Pymnes though the ground is still called Pymnes Park. Within a decade of Wilson's death the estate came into the possession of Lord Burghley and remained with the Cecils for the better part of the next century. It is likely they completely rebuilt the sixteenth-century dwelling, for the mansion that burned in Pymnes Park in 1940 was predominately seventeenth-century style.

The Inventarye of all c[om?]munley the Goods [faded]yties & credites wch latelye belonged and app[er]tayned unto the right honourable Thomas Wilson deceased whiles he lived doctor of Law & one of the principall Secretaries of the Queenes most excellent maiestye differentlye valewed & prysed the . . . [date torn out]

	li	s	d
In the Greene Chamber in one cheste of Pear tree			
In primis the s[ame] Cheste with lock and key [prysed at]		iiij	
One olde worn sheete in t[h]e Bottome of cheste prys[ed at]			viij
Sum		[iiij	viij]
In Damaske Worke			
Three Table clothes of damaske worke of fyve yardes longe at vj s. viij d. the peece prysed at		xx	
Two square table clothes of damaske worke two yardes and a quarter prysed at		v	
Fyve towels of damask worke of fyve yardes longe at iij s. iiij d. a peece prysed at		xvj	viij
Three dozen of napkins of damaske werke vj s. viiij d. the dozen prysed at		xx	
Five coverpanes of damaske werke at ij s. the peece prysed at		x	
One old cupbord cloth of damaske prysed at		*	xvj
Sum	iiij	iij	ij [*sic*]
In Diaper Lynnen			
One Table cloth of sixe yardes longe prysed at		x	
Two olde Ta[ble] clothes of			
Two olde Table clothe[s of] fyve yardes longe at iij s. iiij d. the peece [p]rysed at		vj	viij
One cupbord cloth prysed at			xvj
Three towells of sixe yardes longe at iiij s. the peece		xij	
A dozen & fyve napkins at viij d. a peece		ix	iiij
Suma		xxxix	iiij

	li	s	d
In playne Lynnen			
One worne cupbord cloth with razed worke and fringed prysed at		xx	
One cupbord cloth purled with layd worke prysed at			xij
One cupbord cloth wrought with [bl]acke prysed at			xvj
Two cupbord clothes wrought with blew at iii s. iij d. the peece prysed at		vj	viij
One olde cupbord cloth playne & worne prysed at			viij
Two table clothes meyld with blew at iiij s. the peece prysed at		viij	
Two table clothes worne of iiij yardes longe each at iij s. the peece prysed at		vj	
One table cloth of vj yardes longe prysed at		v	
Two table clothes of fyve yardes long at v s. the peece prysed at		x	
Two table clothes iiij yardes long at iij s. iiij d. the peece prysed at		vj	viij
Three shorte Tableclothes of three yeardes longe prysed at eache of them at ij s. ij d. ob. the peece prysed at		vj	viij
Two table clothes of the same length at ij s. vj d. the peece prysed at		v	
Fyve towells of foure yardes longe at ij s. vj d. the peece prysed at		x	
Foure towells of three quarter cloth of three yards & a quarter longe at xx d. the peece prysed at		vj	viij
One Towell of three quarter cloth of two yardes longe prysed at			viij
vj narrow Towells of Lockerome in length a yarde & a halfe a peece at vj d. the peece prysed at		iij	
Tenne narrow towells lockerom of a yeard longe a peece prysed at		ij	vj
Two old napkins wrought with blew prysed at			vj
xxiij napkins wrought wth layd worke at viij d. the peece prysed at		xv	iiij
Two dozen and nyne napkyns wrought with blew at vj s. viij d. the peece prysed at		xviij	viij
Two dozen of old napkins at iij s. iiij d. the dozen prysed at		vj	viij
Two Sarcenet sweete bagges prysed at			vj
An old cloth to cover the Cheste prysed at			ij
Sum	vij		xx [*sic*]
In a blacke Leather Cheste			
The cheste wth locke & key prysed at		iij	iiij
One payre of Callicow sheetes large prysed at		xvj	
One old fustian Blankett		ij	vj
One payre of fustian blanketts prysed at		vj	viij
Two head sheets of Callicoe cloth valewed at		x	
One payre of sheetes of holland of ten ells prysed at		xv	
One fyne holland sheete of three breadthes conteyninge Tenne ells prysed at		xvj	
Tenne head sheetes of fyne holland of three ells the peece at v s. the peece prysed at		xv	
An old headsheete edged with blacke prysed at		ij	vj

	li	s	d
Three fyne pillowbeares purled & stitched white at ij s. vj d. the peece prysed at		vij	vj
vij pillowbeares at xvj d. the peece prysed at		ix	iiij
Foure pillowbeares of callicoe at xiij d. the peece prysed at		iij	viij
Sixe small stomache pillowbers prysed at		~~ix~~	xvij
Two olde pillowbers prysed at			vj
An olde cusshion cloth spotted with blacke silke prysed at			xvj
An olde coverpane fringed			ix
One other coverpane wrought towardes both the endes with blacke prysed at		iiij	
Another coverpane fringed prysed at		ij	vj
One payre of olde holland sheetes prysed at		v	
One other payre of holland sheetes prysed		vj	viij
Two olde sheetes prysed		ij	vj
An olde Towell prysed at			vj
Sum	vj	vij	viij [*sic*]
In the paynted leather chest with seaven Barrs			
The same leather chest with two lockes and keyes prysed at		xij	
Twelve holland pillowbeares at ij s. vj d. the peece prysed at		xxx	
Eyght course pillowbeares now at xx d. the peece		xiij	iiij
xij payres of holland sheetes at xiij s. iiij d. the payre prysed at	viij		
vj payres of holland sheetes now at x s. the payre prysed at	iij		
lxij ells cuttout into xxv parcells of whited haselborough at xvj d. the ells prysed at	iiij		
The gilte leather hangings of the sayd chamber xlviij yardes at xij d. the yarde prysed at		xlviij	
One ioyned bedstead corded	v		
Fyve curtaynes to the same Bedstead with vallaunce of greene Saye & curtayne roddes prysed at		xx	
A matt to the bedstead prysed at			viij
Two white spanishe blanketts olde prysed at		vj	viij
One olde featherbed wth the boulster in the sayd bedstead prysed at		xvj	
One new featherbed there wth three Boulsters prysed at		l	
One cremson Irish Cadoe wth Longe Lockes prysed at		xxxiij	iiij
One other stainned colo[r] wth shorter Lockes prysed at		xxxiij	iiij
Three curtayne Roddes of yron wth three curtaynes of say red & greene in the windowes prysed at		iiij	
One Flaunders cheste greened wth xvij barres lockes & keyes		xiij	iiij
An yron money cheste wth lȯcke & key of the smaller sorte prysed at		xx	
Two spanish chayers seated wth blacke leather prysed at		vj	viij
A fouldinge Table wth a cupbord wth it prysed at		iiij	

	li	s	d
A payre of Virginalls cou[er]ed wth blacke leather prysed at		xxx	
A lookinge glasse wrought with Ivorye prysed at		xxx	
One payre of Virginalls in waynscott color prysed at		x	
The olde womens stooles seated wth velvet olde prysed at		ij	vj
A courte cupbord prysed at		iiij	
Two greene carpetts of cloth of two yardes prysed at		v	
A payre of leatten andyrons wth feete of Iron prysed at		xij	
A payre of yron creepers prysed at			xiiij
A rapyor & dagger gilte wth the girdle & hangers of leather prysed at		xiij	iiij
Two writinge deskes cou[er]ed with Leather blacke havinge two lockes & two keyes prysed at		xxx	
One other deske wth Locke & key prysed at		iiij	
A frame of wainscott to them prysed at			xij
One fyre shovell of Latten prysed at			xx
One payre of Iron Tonges tipte with Latten			xx
Sum	xlij	xviij	viij [*sic*]
In the Kitchen			
One payre of yron rackes greate prysed at		x	
One smaller payre prysed at		vj	viij
One payre of Iron Andyrons prysed at		iij	iiij
An Iron fyre forke prysed at			viij
Fyve pott rackes of yron prysed at		iij	iiij
iij Gridyrons prysed at		ij	vj
Two slyces two fyrerackes & two flesh hookes prysed at			xviij
An apple cradle of yron			xij
Sixe payre of pothookes		iij	
Two great spittes		v	
viij other square spittes shorte & longe prysed at		x	
Fyve birde spittes shorte & longe prysed at			xx
iij payre of tonges wth the fyre shovell prysed at		x	
Foure flatt yron Barres for the Rangs prysed at		vj	viij
A longe fyre Racke of yron prysed at			xij
Two large drippinge pannes of Iron at iij s. the peece prysed at		vj	
Three smaler olde dripping pannes prysed at		ij	vj
Three Iron pestles small & greate prysed at		ij	
A small cleaver of yron			vj
Two over liddes of yron		ij	
A kettle band & two small Trivetts prysed at			xviij
Three fryinge pannes each smaller than other prysed at		ij	vj
A lardge yron pott prysed at		iij	iiij
One payre of tonges & fyre shovell of yron			x
One lardge Latten chafing dish wth a foote olde prysed at		ij	
Foure chafing dishes some smaler then other some wth a table ringe prysed at		vj	
Two olde warminge pannes one better then the other prysed at		iij	
Two copper kettles one rounde the other square weyinge lxiij li. at vj d. the pound prysed at		xxxj	vj

	li	s	d
Three brasse pannes weyinge xxx poundes at vj^{d} the pounde prysed at		xv	
Two olde Cullender basons of Latten three one brasse panne one old brasse kettle one skinner one pot of Lead one candee plate all weyinge xxvij poundes at vj d. the pounde prysed at		xiij	vj
One olde brasse kettle one brasse panne both bayled wth yron in weyght xlviij pounds at v d. the pound prysed at		xx	
Fyve chaffers wth steales of brasse one olde broken chaffer foure brasen [m]orters two pestles of brasse one Chaffer of brasse wth a handle in weight all cv poundes pyk iij d. ob the pounde		xxxij	viij
Foure brasse potts one chaffer wth a handle a small possenet wth a steale weyinge all cxij pounde at iij d. ob the pounde prysed at		xxxij	viij
Foure brasse potts no weight cxiiij li. at iij d. ob the pounde prysed at		xxxiij	iij
Three brasse potte wth a cover & one brasen Chaffer wth a cover weyinge lvj pounde at iij d. ob the pounde		xvj	viij
Olde broken brasse of Covers vessells in weight lxiiij li. pounde at ij d. the pounde prysed at		x	viij
Foure Latten Candlesticks prysed at		iij	iiij
Suma	xv	vj	xv [*sic*]
In pewter			
Two dozen & xj sawcers a dozen porringers two dozen of plate Trenchers one dozen of smaller dishes one dozen of greater dishes one dozen			
Of platters in weight cv li. pounde at vj d. the pounde prysed at	ij	xvj	
xij platters tenne lardge dishes two dozen of lesser disshes xj porringers a dozen of Sawcers a dozen of Sawcers a dozen of trencher plates in weight cxxv poundes at v d. the pounde prysed at		lij	j
One dozen of platters two dozen of disshes two dozen of small dishes xiij Sawcers one dozen of plate Trenchers weyinge cxij at v d. the pounde prysed at	ij	ix	x
iiij chargers xvij pye plates ij Basons two cullenders ij dozen & xj dishes one dozen & viij Trenchers plates in weyght cxij pounde at v d. the pounde prysed at		xlvj	viij
Three Basons wth three Ewers one bason fyve platters fyve other platters one dozen of dishes sixe plates one Sawcer vij candlesticks one quarte pott & two pynte potts silver fashion two pottle wyne pottes two potle ale pottes weyinge cxij ~~li~~ at v d. the pounde prysed at	ij	vj	viij
vij chamber potts viij flowere potts iiij Candlesticks iij sawltes wth one cou[ered] two wyne potts a quarte pynte pott a vineger Crewett and aquavite bottle a quarte ale pott a pynte ale pott three drinkinge potts & a Laidle weyinge xliiij poundes at v d. the pounde prysed at		xviij	iiij

	li	s	d
Three payre of pewter candlesticks new at ij s. the payre prysed at		vj	
Two olde platters one dozen of dishes xj sawcers all of Iron white plate weyinge twelve pounde at v d. the pounde prysed at		iiij	
One greate choppinge borde prysed at			vj
One Flaunders cheste wth flatt Barres prysed at		vj	viij
One small settle of wainscott prysed at			viij
One Settle of Oken bord prysed at			vj
Suma	xiiij	vj	xj [*sic*]

In the Inner kitchen

One greene sawce maker & a musterd Querne all of stone prysed at		iiij	
One olde Borde prysed at		ij	
Two Trevetts prysed at			xvj
One payre of bellowes prysed at			x
One choppinge borde prysed at			iiij
One water bucket prysed at			viiij
Suma		ix	ij

In the chamber over the kitchen

A slender olde field Bedstead with a Teaster and Curtayne of olde redd Sarcenet prysed at		xiij	iiij
A trundle bedstead wth a matt prysed at		ij	
The hangings of dernix greene & yealow conteyninge lv yardes at viij d. the yarde prysed at		xxxvj	viij
An yron rodd in the window wth a curtayne of Say redd and greene prysed at			xiiij
A small olde featherbed rewed tyke with a boulster prysed at		xl	viij
Another small featherbed wth a Boulster prysed at		xiij	iiij
An old featherbed wth a tornall tyke prysed at		viij	
An old featherbed of Brizell with a Boulster prysed at		xv	
Another olde featherbed wth a bolster of Tornall tyke prysed at		xxiij	iiij
Another bed & boulster of Brizell tike prysed at		xxvj	viij
An olde featherbed wth a Boulster rewed tyke prysed at		xx	
Foure old flock boulsters at viij d. the peece prysed at		ij	viij
One longe white wooll mattres prysed at		vj	
A little old flock mattres prysed at		iij	
An olde mattres prysed at			xij
An olde checker rugge russet color prysed at		iiij	
A cou[er]let of Imagerye lyned with white mantle prysed at			xvj
A cou[er]let of flowred worke lyned with canvas prysed at		xij	
An other Flowre worke olde lyned wth Canvas prysed at		ij	
A cou[er]let of Imagerye prysed at		vj	viij
An olde cou[er]let of flowre worke prysed at			xij
An old dernix cou[er]let prysed at		iij	
An olde spanish Blankett white prysed at		ij	vj
A small red Blanket prysed at			xij
An olde redd Coverlett prysed at			vj

	li	s	d
An old Woodmall Blankett prysed at			xiiij
A peece of an old Tapestrye cou[er]let with an old Turkey carpet prysed at			viij
A drawinge Table wth Framme prysed at		iij	
A carpet of dornix to the same green & yeallow, prysed at			xx
A payre of yron creeps prysed at			xij
Sum	xj		iiij [*sic*]
In the Black Chamber over the kitchen			
A ioyned Bedstead		xiij	iiij
An olde table wth a frame prysed at		iij	
A fonne of dealebordes prysed at			xvj
Sum		xvij	viij
In the yealow Chamber			
A flockbed with a Boulster prysed at		ij	
An old Wooll Mattress prised at		iiij	
Another small Mattres very old prysed at			xij
Fyve Mattresses old & course at xx d. the peece prysed at		viij	iiij
Three flock Boulsters olde prysed at			xij
~~Fyve Mattresses~~ a featherbed wth a boulster of brizell tyke		l	
Another featherbed & boulster of right Brizell tike of a lesser qualitye prysed at		l	
Another featherbed & boulster of Brissell tike		xxxiij	iiij
Another featherbed right Brissell not soo good prysed at		xxvj	viij
Another featherbed			
Another Featherbed & boulster right Brizell prysed a.		l	
An old featherbed & boulster		xvj	
Two old featherboulsters		vj	viij
Fyve downe fustian pillowes at ij s. the peece one with another prised at		x	
One white frize blanket p[ry]sed at		ij	
One olde white spanish blanket prysed at			xij
vj olde spanish Blanketts one with another prysed at		x	
A small Tapestrye cou[er]let prysed at		x	
An olde larger cou[er]let wth flowres lyned with Canvas prysed at		x	
A countrey cou[er]let red & greene prysed at		iiij	
Another such cou[er]let white & blacke prysed at		iiij	
A payre of very old blanketts very small prysed at		iiij	
An old peece of flowre Tapestrie prysed at		ij	vj
An old torne dornix cou[er]let pr[y]sed at			viij
An olde Lyned coverlett		ij	
A hanginge of dornix olde greene & yealow in vij peeces c . . . t [faded] xxvij yardes at vj d. the yarde prysed at		xiij	iiij
A field bedstead ioyned and bounde up together prysed at		xij	
		[no totals]	

	li	s	d
In a chest covered wth greene Leather paynted & barred wth small Iron Barres & standeth in the great Leather chamber			
A shorte gowne of damaske with sixe Wells of velvet faced with Wolverine & furred with black coney prysed at		xl	
Five velvet cappes some olde soe one wth another prysed at		xx	
A cloake of black cloth wth three broad weltes of velvet faced with velvet & lyned wth bayes prised at	iiij		
A shorte Gowne of black velvet with a pasemen about it faced wth wolverine & furred with collaper prysed at	v		
A velvet coate layd wth three p[ar]chmente Laces all blacke lyned with fustian prysed at		xxxiij	iiij
A cloth coate of french marble with flat winges & laced prised at		xx	
One Jerkin of black velvett sleevets layd about wth p[ar]chment Lace & edged wth sables & lyned with russet Fustian prysed at		xx	
Another black Jerkin of velvet sleevets & layd about wth foure Laces edged wth sables & furred wth Callaber prysed at		xx	
A Jerkin of blacke ~~faced~~ wrought velvett sleevets edged wth sables lyned with fustian & prysed at		xx	
Another Jerkin of black velvet laced & lyned with fustian		xiij	iiij
Another Jerkin of black velvet and lyned with fustian		x	
One Jerkin of black Taffeta with three yardes of the same lyned with fustian prysed at		vj	viij
One other Jerkin of blacke Taffeta with one Lace about it & lyned with fustian		v	
One Satten dublet black wth a straight cutt & tufte nowe prised at		xxxiij	iiij
Foure black Satten dubletts cutt prysed at		xxvj	viij
One black satten dublett cutt & better then any of the foure prised at		xvj	
One olde black satten dublet playne prysed at		v	
Two payre of black velvett breeches of playne paynes prised at		xx	
One old gowne of blacke cloth with three gardes of black velvet faced wth olde martens & furred with Squirrells prysed at		xl	
Two payre of olde blacke velvet breeches wth Laced paines prised at		xvj	
Two Taffetie dubletts blacke cutt prysed at		xiij	iiij
One Jerkin of black satten layd out thicke with weltes of velvett		xx	
Two payre of Taffeta breeches payned color black		xvj	
One payre of black [ra]sh breeches payned & lyned wth vushorne velvet prysed at		xxv	
One payre of black rashe breeches payned & lyned wth Sarcenet		x	

	li	s	d
Of Aggetts Buttens lxxxiij wth steales of the forsayd Jerkins prysed at	ij	xv	iiij
One dozen & a halfe of gelde Buttens Strawberie fasshion p[ry]sed at	ij	xiiij	
Sum	xxxvj	ix [*sic*]	

In the gilte Leather Chamber

One crimsen Cadoe shak [*sic?*] prysed at		xxxiij	iiij
Foure white Caddes at xx s. the peece prysed at	iiij		
One other crimsen Cadoe		xxxiij	iiij
One murrey Caddoe olde		xij	
One flatt barred cheste		v	
Tenne payres of coursse sheets at iij s. the payre		xxx	
iij payres of worne sheetes at v s. the payre prysed at		xv	
One payre more of sheetes		iij	
Three table clothes each of them foure yardes longe a peece		vij	vj
Two shorte Tableclothes at xvj d. the peece prysed at		ij	viij
xj olde napkins playned at		ij	
Fyve olde diaper napkyns			xv
Three olde pillowbeares			ix
A Boulster longe			xx
A field bedstead of Walnut Tree cou[er]ed & corded wth three curtayne roddes prysed at		xx	
A small Trucklebed corded olde prysed at			xx
Two old cloth sackes of Leather of iij s. iiij d. the peece prysed at		vj	viij
Two old velvet chayres the one greene the other Tawney prysed at		x	
A chayre of Leather wth gilte flowres on yt prysed at		v	
Two spanishe chayres of blacke Leather prysed at		viij	
A drawinge Table of wainscot prysed at		x	
vj ioyned stooles prysed at		v	
A Courte cupbord wth a Till & lock & key prysed at		xij	
Two fouldinge courte Tables at iij s. iiij d. the peece prysed at		vj	viij
A small courte cupbord of wainscott prysed at		iij	
Foure curtaynes of greene saye with roddes of Iron		vij	
A payre of rostinge Creepers prysed at			xvj
Another payre of small creeps with an olde one prysed at			xij
A payre of Latten Andyrons with feete of Iron prysed at		xv	
A small payre of Tonges tipted with Latten prysed at			xij
A fyre shovell to the same			xij
ij olde courte stooles with seates of Leather prysed at			xvj
A close stocke of pewter with a panne olde & broken prysed at			xx
Two greene cloth carpetts fringed with silke small & worne		iij	iiij
A Picture of Suzanna		iiij	
A picture of poeticall devise prysed at		iiij	
A small picture of Jonas prysed at		iij	iiij
viij turned Bedstaves			iiij
A small cheste cou[er]ed wth seale skinnes & in it sixe glasse Bottles for wyne prysed at		xij	

	li	s	d
Two old Trunkes for apparelle with Locke & key by the one with Leather prysed at		x	
Sum	xxix	v	viij [*sic*]
In the gilte Leather Chamber & out into the great cypres cheste			
A longe wrought velvet gowne faced with Sables & furred with Squirrels prysed at	xxxvj	xiij	iiij
A gowne of black velvet wth a broade p[ar]chmente lace of blacke silke furred with squirrels & faced with pootes prysed at	xxviij		
Another black velvet gowne with foure purled lace small faced with Sables & lyned with Squirrells	xiij	vj	iij
A black velvet gowne wth small black Lace faced with vushorne velvett & lyned with russet fustian	xix		
An olde velvet gowne with two Laces of blacke silke faced with Budge lyned with blacke bayes prysed at	xv		
An olde damaske gowne wth a welte of velvet faced wth wolverine & furred wth blacke coney prised at	iij		
An ~~a cheste~~ olde black Satten gowne wth fyve yardes of black velvet faced wth old martens & furred with Squirrells prysed at		xxxiij	iiij
A gowne of blacke damaske with one broad p[ar]chm[en]t Lace faced with vushorne velvet & lyned with fustian prysed at	viij		
A gowne of black taffatie unlyned wth three yardes of the same prysed at	iiij		
A gowne of black damaske with a p[ar]chm[en]t lace faced with Taffetye prysed at		xxxiij	iiij
A gowne of blacke silke Grogaron wth two Laces of black silke & faced wth black Taffetie & lyned wth russet fustian prised at	v	x	
An olde damaske gowne with a black silke Lace and furred wth Conye prysed at		xx	
Suma	cxxvj	xvj	iij [*sic*]
One longer then the other prised at			xx
Two course table clothes			xvj
xvj handkerchers		v	iiij
Two kerchers yardes a peece prysed at		ij	
Two small course Towells prysed at			iiij
xj playne holland shirtes one with another at v s. the peece prysed at	ij	xv	
Two spanish Leather purses with damaske ringes prysed at		v	
xij small bagges			vj
A Conye case of Eboine with the Instrumente accordinge		v	
Suma	xv	iiij	iiij [*sic*]
In the greene Chamber			
One ioyned Bedstead with three roddes of Iron prysed at	iiij		

	li	s	d
Fyve curtaynes to the same bed benige [*sic*] of red and greene saye		xvj	
One Checker Caddoe prysed at		xvj	
One tawnie mantle prised at		iij	iiij
Two white Spanish blanketts		vj	viij
Two old woollen mattresses		ij	
One featherbed with the bolster prysed at		xl	
One flocke Boulster			xij
One cupbord wth a presse underall of wainscott prysed at		xxvj	viij
One courte cupbord prysed at		ij	
One lardge cypres cheste with Lock & key prysed at		xl	
A payre of double virginalls with a frame prysed at	iij		
One large cheste of wainscot a yard & a halfe longe wth lock & key prysed at		vj	viij
One olde flat barred cheste cou[er]ed wth Leather lock & key		v	
Two olde Table clothes			xx
One playne tablecloth of foure yardes prysed at		iij	iiij
Tenne Table clothes of three yardes each of them at ij s. iiij d. the peece prysed at		xxiij	iiij
One olde playne Table cloth			xvj
One olde diap[er] table cloth prysed at			ix
One course table cloth of two yardes longe prysed at			xvj
One square cipres cheste wth Locke & key prysed at		xx	
The hanginges about the chamber of greene saye prysed at			viij
A payre of Iron Andyrons tipted with Latten prysed at		viij	
Two Iron creepers			xij
An old Wainscott cheste		ij	
A longe hanginge deske of Wainscott prysed at		iij	iiij
An olde cheste wth high sate [*sic?*] lock & key prysed at			xij
A greate wooden cheste wth lock & key prysed at		iij	
Suma	xviij	iiij	v [*sic*]

In the Chapple Chamber

The hangings of greene Say prysed at		x	
A ioyned Bedsteed corded		xiij	iiij
An olde Wool mattres		iij	iiij
A fustian Boulster of downe		vj	
vj downe pillowes at ij s. the peece prysed at		xij	
Sixe small pillowes		ij	
ix cusshions of flowre work Tapestrye one wth another prysed at		xiij	vj
Two olde tapestrye cusshions of rose & pome sarcenet			xij
Foure smaller cusshions of Tapestrye stuffte wth feathers		iiij	
Foure Cusshions of Needle Worke wth feathers		iiij	
viij cusshions of gilted Leather stufte wth feathers		viij	
A small wicker chayre			xij
An old Blanket & a halfe		iij	
An olde Cupbord prysed at			xvj

	li	s	d
Foure yardes of greene cloth for a carpett prysed at		xx	
Another of the same stuffe & length olde prysed at		x	
Two cupbord clothes of greene cloth & one window cloth fringed prysed at		iiij	
A cupbord cloth more of greene		ij	
A Turkey carpet of three yardes long prysed at		xx	
A Fowldinge Table		iij	iiij
An old field Bedsteed		[faded]	
A payre of creepers			viij
An Iron Back		ij	
Suma	vij	iiij	vj [*sic*]

In the Streete Chamber

A Canapie of crimsen satten flowred with Embroderie of cloth of Golde gilte bells fringed wth crimsen silke & golde with two curtaynes of murrey Taffetie Sarcenet prised at	v		
One Canapie of yealow satten embroidered with roses of red silke with a fallinge curtayne of Orange Tawney Sarcenet prysed at		xl	
A cover of a field bed of crimsen damaske fringed with Crimsen silke with fyve curtaynes of crimsen silke Taffetie prysed at	vij		
A fyne quilte of Turkey crimsen silke on the one side & yealow tyke on the other side	vij		
A longe Cusshion of crimsen velvet embroaidered with golde lyned with purple Satten stufte with feathers prysed at	iiij		
A chayre of crimsen velvet ~~prised~~ wth a stoole of the same stuffe prised at	iij		
A fyne counter poynte or quilte of white Callic[o] wth a frindge of yealow silke & tasseled prysed at	v		
A cover of silke Taffeta redd for a field bed & fyve curtaynes of red Taffeta prysed at	ij	vj	viij
A vallaunce of needleworke crewell lyned with greene & red Saye with fringe greene & red of Crewell also prysed at		xvj	
Fyve crimsen Taffetta curtaynes prysed at		xl	
A cover for a field bedsteed of red valure with vallaunce of the same fringed with greene crewell prysed at		xvj	
Fyve curtaynes of redd & greene duraunce prised at		xxvj	viij
A cover for a square field bed of scarlet dreste with crimsen frindged silke & the curtaynes of the same stuffe prysed at	iiij	x	
A Turkey quilte of red silke lyned with blew Buckeram prised at	ij	xiij	iiij
vj cusshions of Tapestrie of Mr Secretaries Armes[8] stufte wth feathers at viij s. the peece prysed at	ij	xvj	

[8] Wilson's arms have been described as "Sable, a wolf salient or, in chief three estoiles of the last" (Maddison, Arthur R., *Lincolnshire pedigrees* **52**: 1090, London, Harleian Society Publications, 1902–1906). Wilson was born in Strubby, Lincolnshire (*cf.* my article, Some notes on Dr. Thomas Wilson and his Lincolnshire connections, *Lincolnshire Historian* **2**: 14–24, 1957.

	li	s	d
Two longe pillowes of cloth of Tyssew yealowe prysed at		xl	
One other of golden blew prised at		xx	
vj small cusshions of needle worke crewell with roses stufte wth feathers prysed at		xxx	
Foure needle worke cusshions of Crewell wth Hartechokes stuffed with Feathers prysed at		xiij	iiij
ix cusshions of needle Worke of Walter flowres stufte wth feathers prysed at		xxj	
A carpett of needle worke crewell of roses with a deepe fringe of crewell lyned with greene buckerom prised at	iiij		
A Turkey carpet moste of white worke knotts & the grounde murrey of vj yardes longe two yardes broad & lyned wth black Bucker[im] prysed at	x		
Two shorte Turkey carpetts eyther of two yardes quarter longe of Ferritt silke prysed at	iiij		
A Pillow of Tissew blew silver olde		xij	
A quilte of channgeable silke on the one side & blew silke on the other side prysed at		xx	
An olde Teaster of black damask of colo[r] redd & a head peece of the same lyned wth Buckarom prysed at		v	
A wool mattres of Tyke		v	
A featherbed of Tyke cewed		xiij	iiij
Two Brissell boulsters stufte wth feathers the one wth the other prised at		xij	
A ioyned Bedstead wth Beech Pillows & corded prysed at		x	
Three wooll mattresses		xij	
One brizell featherbed & boulster prysed at		xl	
Two spanish Blanketts		vj	
One checker Caddoe		xxiij	iiij
One olde Tawney mantle			xiij
One olde cou[er]let of Flowres		iij	
A foote cloth of velvet much worne fringed wth silke lyned with Buckrom all black prysed at	ij	vj	viij
An olde red Blankett		ij	
A Wainscott presse		vj	viij
An old Wainscott cupbord		iiij	
A Callicot cupbord cloth red & white in two peeces		iij	iiij
ij olde Tawney velvet stooles			xvj
The hanginges beinge paynted Cloth of that Chamber prysed at		xiij	iiij
An olde wainscott Settle			xij
A wicker scryne			xij
A payre of Bellowes			xij
Suma	lxxxiiij	xij	j [*sic*]

In the leades Chamber

The paynted clothes for hanginges prysed at		vj	viij
An old ioyned Bedstead		viij	
An olde Wainscott presse wth Lock & key prysed at		x	
An old small Table			xij

	li	s	d
An olde strawne chayre			vj
A rough matt prysed at			viij
A Brissell bed & a boulster of Feathers prysed at		xl	
Two olde spanish blanketts the one better than the other		vj	
A Checker Caddoe		xiij	iiij
An olde cou[er]let of blacke Bridges of satten embroidered wth garters & lyned with blew buckerom prysed at		vj	viij
A lardge cou[er]let of Tapestrie lyned with canvas	ij	xiij	iiij
A Tufte mockadoe carpett of black greene & redd lyned with black Buckerom & ~~faced~~ frindged with Crewell		xl	
A Carpett of Tapestrie with corpes Christies fringed wth redd Crewell embroidered wth black values & lyned wth canvas prysed at	ij	xiij	iiij
A vallaunce of black valure & fringed wth red		ij	
One case of Daggs spotted with damaske & a case of black Leather to them belonginge prysed at		xx	
One other case of playne dagges with the like case of Leather prysed at		x	
One dagge with his case of Walnut Tree stocke prysed at		v	
Two Arminge swordes		iij	iiij
Suma	xiij	xix	x
In the Garrett Chamber			
Two ioyned Bedsteads		xx	
A small Canapie Bedstead prysed at		ij	
Foure partizanes		viij	
One haulbert Armed downe the Stuffe		iij	
One gilte Haulbert		ij	vj
One black Armo[ur] wth Curetts a pofe prised at		xxxiij	iiij
iij playne white corsletts prysed at	iiij		
Sum	viij	xv	vj [*sic*]
In the Gallerye wherein the pictures are Eyght square Tables wth a frame of Beares all Cipres prysed at	iij		
A square damaske Table wth a frame of Wainscott prysed at		xiij	iiij
A countinge cheste with Ropes standinge in his frame wth three Lockes & keys prysed at		xl	
A foote pace of two steppes		ij	
A deske of walnut Tree			xij
A small Cipres cheste wth Locke & key prysed at		xxiij	iiij
A Countinge cheste with Ropes whereof some are with Locke & keyes prysed at	v		
Three Courte cupbordes		x	
A Spanish Chayre seated with Leather		iij	iiij
Sum	xij	xij	viij [*sic*]
In the Parlor			
A longe drawinge table prysed at		xl	
A danske Table with a frame prysed at		vj	viij
A cupbord of wainscott wth Lock & key prysed at		x	
A courte cupbord carved		viij	

	li	s	d
A frame for Virginalls prysed at			xx
~~A payre of Virginalls with regolls stoppes & theyr frame~~		iiij	
[In margin in different hand: "Dylyvered by order from Mr. Secre. Wals(i)n(gham)]			
Two wainscot Frames		vj	
viij ioyned stooles at viij d. the peece prysed at		v	iiij
Two velvet chayres the one greene & the other carnac̃[i]on prysed at	x		
Three women square stooles cou[er]ed wth velvet prysed at		ij	vj
A Latten standish to satt potts on at the service of meate prised at		xx	
One hanginge braunch of xij candlestickes of Latten prysed at		xiij	iiij
Three braunched candlesticks of Latten prysed at		x	
A payre of Latten Andirons with Iron feete prysed at		xxxvj	viij
Two Iron creepers prised at			xx
An Iron back in the chimney prysed at		iiij	
A rodd of Iron wth two Curtins of saye prysed at		x	
One smaller rodd wth a curten prysed at			xviij
A payre of olde rigalls prysed at		xl	
Sum	xv	vij	ij [*sic*]
In the hall			
A drawinge Table uppon his frame prysed at		x	
One ioyned forme prysed at			xvj
One other older then that prysed at			viij
A square Table uppon his frame prysed at		ij	vj
Nyne ioyned stooles prised at		vj	
A Waincot chayre with a Back prysed at		iij	
A Waincot cupbord with a deske prysed at		x	
A standinge deske to read one prysed at		iij	
A payre of Andyrons tipte with Latten prysed at		vj	viij
A Lanterne of glasse prysed at			xij
Suma		xliiij	ij
In the greene yarde			
A Still of Tynne the Bottome Leade prysed at		iij	iiij
Suma patet			
In the Butterye			
A wainscot cupbord for Plorte [*sic?* plate?] prised at		v	
A case cupbord Wise for Glasses prysed at			xvj
A presse for napkins prised at			xij
An olde bread Binne prysed at			viij
An olde cheste with Locke & key prysed at			xx
An olde Settle of wainscot cheste Wise prysed at		ij	
A cupbord prysed at			xvj
Sum		xiij [*sic*]	
In the Beere Seller			
~~Fourteene hogsheads of stronge Beare prysed at~~	~~v~~	~~x~~	
[Marginal note in different hand: "There was not any mony made of his bear.[9]"]			

[9] This marginal note and all those which follow seem to have been penned by Wilson's son and heir, Nicholas.

	li	s	d
In the Wyne Seller			
Foure hogsheades of Gascogne Wyne prysed at	x		
Halfe a Butt of secke prysed at	iij		
Sum	xiij		
In the greate hall and to be removed			
A longe Table standinge uppon a Frame prysed at		vj	
Olde payned Wainscott in Tenne peeces prysed at		viij	
A forme prysed at			viij
Sum		xiiij	viij
In the olde chamber			
An olde ioyned bedstead carved prysed at		iij	iiij
Another ioyned bedstead prised at		iiij	
An olde cupbord prysed at			xvj
The hanginges of paynted clothes prysed at		ij	
One rough matt prysed at			viij
Sum		xj	iiij
In the Garden Chamber			
Olde saye hanginges prised at			xij
A Bedstead with Beachin Pillows prysed at		iiij	
A Truckle bed corded prysed at			xx
An olde shorte Forme prised at			vj
Sum		vij	ij
In the painters Chamber			
A Settlebed of Wainscot prysed at		v	
Sum patet			
To be removed into safe keepinge			
xviij deale bordes at ij s. the peece prysed at		xxxvj	
Sum patet			
In the Stable			
A black Leather Saddle wth a seate & gardes of velvet wth harneys bridle gilte studdes & black Stirreps all much worne prysed at		viij	
Three old black Leather saddles with theyr bridles & one without a bridle one wth another prysed at		xiij	iiij
One Male Pillion with Girthes prysed at			vj
One other Sadle of black Leather with bridle & stirropp prised at			vj
Sum		xxvij	x
To be removed out of the church			
Foure such plankes xxvij foote longe & xviij ynches broade a fyve shellinges the peece being al of Oake prysed at		xx	
Foure oken plankes more wherof two xxiiij longe each of them the one three inches thicke & the other foure ynches thick at viij s. the peece xvj s. the other plankes is xviij foote longe & foure inches thick at viij s. the peece xvj s. prysed at		xxxij	
Sum		lij	[remainder faded]

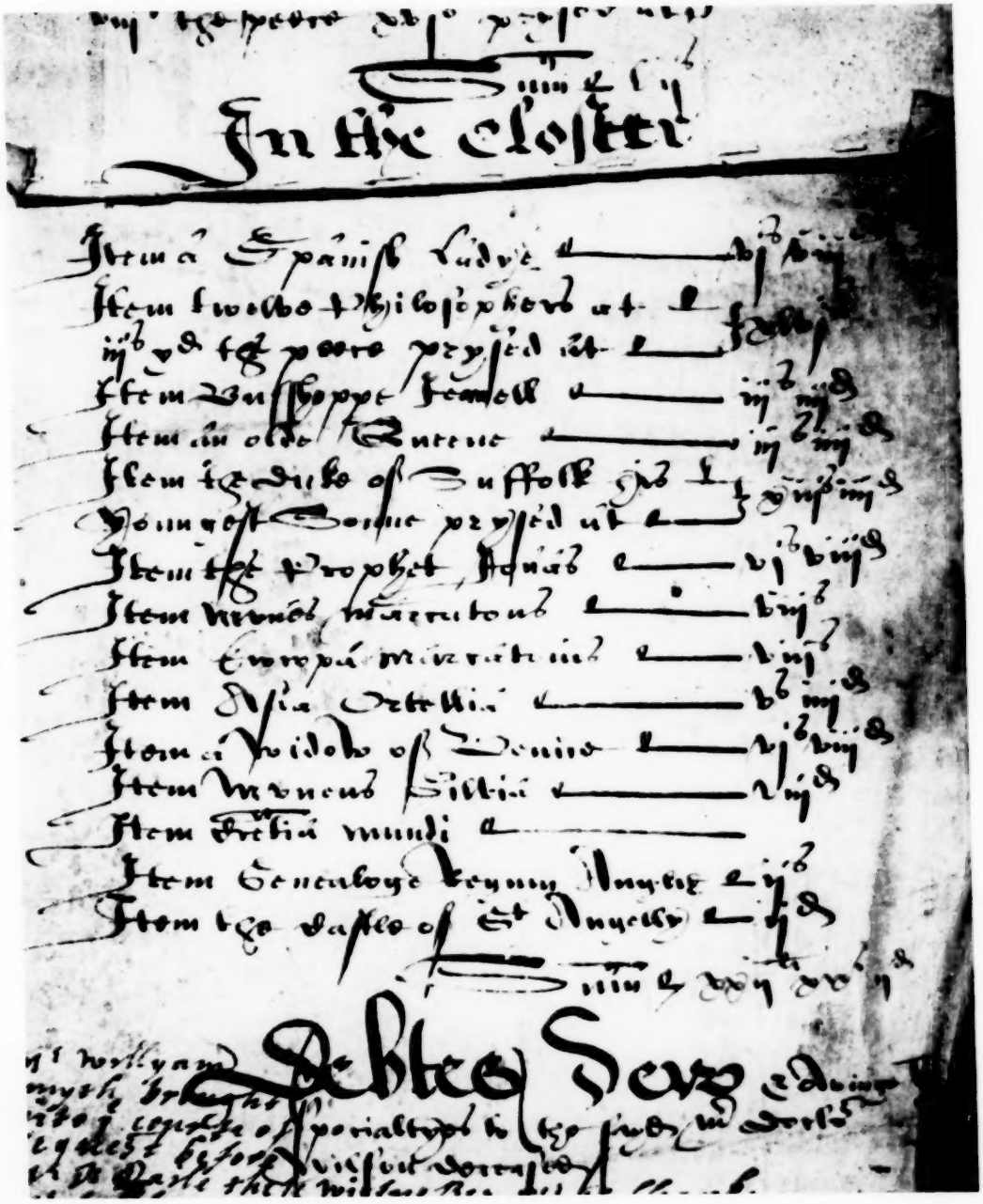

FIG. 1. "In the Closter."

	li	s	d
In the Closter [*cf.* figure 1]			
A Spanish Ladye		vj	viij
Twelve Philosophers at iij s. x d. the peece prysed at		xlvj	
Busshoppe Jeawell [10]		iij	iiij
An olde Queene		iij	iiij
The Duke of Suffolk his youngest Son [11] prysed at		xiij	iiij
The Prophet Jonas		vj	viij
Munes Macatous		viij	
Ewropa Macatoius		viij	
Asia Ortellia		v	iiij
A Widow of Venice		vj	viij
Muneus Silvia			viij
Cre[a]tia Mundi			
Genealoge Regum Anglie		ij	
The Castle of St. Angelly [12]			ij
Sum	xxij	xix	ij [*sic*]
Debtes dew & owinge by specialtyes to the sayd Mr Doctor Wilson deceased			
[Marginal note in different hand: "Mr. Willyam Smyth [13] brought into ye courte of request before Mr D. Daile [14] these witnesses per a: Clearke & my Uncle Mr Godfrye Wilson [15] . . . My Father Forgave him this monye uppon consyderacion."]			
In Primis George Smith [16] by Specialtye [17]	cc		
~~William Smith gent his sonne by Specialtye (sic)~~	~~xx~~		
Nick Angews [18] as appeareth by Specialtye	xx		
[Marginal note in different hand: "This is to be recovered of Mr (not clear) the soon (sic) Mr. Kagens You may hear of this gentleman at Mr secre Chamber."]			
Suma	cclx		
More detts dew & owinge to the foresayd Mr. Secretarye Wilson at the tyme of his decease			
The Lorde Treasurer [19] for one hundred fortye & sixe Loades of Tymber [20] at vj s. the Load	iij^{xx}xiij	xvj	[£73 16s.]

[10] Probably a portrait of Bishop Jewell (1522–1571), bishop of Salisbury and celebrated divine. Wilson and the bishop were warm friends.

[11] Probably a portrait of Charles Brandon or one of his sons, successively dukes of Suffolk. During his early life Wilson was closely associated with the Brandons. He must have known Charles who was mainly responsible for putting down the Lincolnshire Rebellion of 1536 and who married the prominent Lincolnshire lady, Katharine Willoughby. At Cambridge, Wilson served as tutor to the two small sons of the widowed Katharine who by the early 1550's was one of the stoutest Protestants in the realm. When Wilson's two pupils died of the sweating sickness in 1551, he penned a panegyric (*Epistola de Vita et Obitu duorum Fratrum Suffolciensium Henrici et Caroli Brandon*) in their memory.

[12] This was likely a picture of the Castelo San Angelo where Wilson was imprisoned in Rome during 1558–1559.

[13] Unknown.

[14] Valentine Dale (?), (d. 1589). Civilian, diplomat, and friend of Wilson.

[15] Thomas' brother, a London draper. Nicholas wrote this.

[16] Unknown.

[17] Specialtye. Specialty, a special contract, obligation, or bond, expressed in an instrument under seal.

[18] Unknown.

[19] William Cecil, Lord Burghley (1520–1598).

[20] Apparently this timber was purchased from Wilson for use on Burghley's estate at Theobalds not far distant from Wilson at Edmonton. Edmonton lay situated in Middlesex on the high road to Hertford. During the Tudor period and after there was an extensive trade in timber by means of the river Lea which flowed within three quarters of a mile of Edmonton.

	li	s	d
More due by the Lorde Treasurer for thirtye two deale Bordes at iiij s. the peece	lxviij		
Mr. Alderman Martin[21] for five Loades & xj foote of Timber had from Edmonten at xiij s. iiij d. the Loade	iij	lx	vij
Christopher Baker [22] for fyre Wood	xj		
More for a gray mare	iiij		
Thomas Wilson Cowper [23] for wyne	x		
Mr Graston [24] for money	xx		
Rentes for his Landes	l		
Rentes for his corpes devident & s in Durh[a]m [25] by estimation	iiij^{c} [£400]		
Sum	vj^{c}xl [£640]	v	vij [*sic*]

[Marginal note in different hand: "200 li. thear uppn of this same not as yet receaved by the Bushoope his account by Indenture the wch my Uncle Godfrey Wilson hath who lyes at St. Katherin thear is more money dewe us thear doth appear."]

In Leases [26]

The Lease of his house in St Katherines by estimac[i]on worth	cl		
The Lease of a Stable there by estimac[i]on	xx		
The Lease of a litle Tenement there by estimac[i]on worth	xx		
The Lease of the Manor of Saultfletsberye [27] by estimac[i]on worth	vj^{cxxxiij} [£633]	vj	viij
The Lease of Mawrisfield [28] by estimac[i]on worth	iij^{cxxxiij} [£333]	vj	viij
His horses & mares solde and unsolde valewed at	ij^{clxxxvj} [£286]	ij	vij
Sum	xiiij^{cxlij} [£1442]	xv	vij [*sic*]

In Lande appoynted by his Will to be solde by

Item the House & Lande at Edmonton by estimac[i]on valewed at Sum patet	iij^{cl} [£350]		

In Goods in the possession of M[ist]res Wilson by

In primis a chayne of Aggetts esteemed at	iij^{xx}vj [£66]	xiij	iiij
A Bason & Ewer gilte weyinge fiftye seaven ounces at vj s. the ounce valewed at	xvij	ij	

[Marginal note in different hand: "These parciels Underwrytte never came unto [faded] hands so farr foorth as they are cro(faded)"]

[21] Possibly Richard Martin who was lord mayor of London in 1581.

[22] Unknown.

[23] Unknown.

[24] Unknown.

[25] Rents accruing from Wilson's deanship at Durham. Wilson's appointment as Dean of Durham in 1578 was a political reward similar to his mastership at St. Katharine's Hospital. Wilson never visited his charge: he was installed by proxy and had letters of dispensation for non-residence (Durham Dean and Chapter Register, **3**: fols. 2v, 3v). His annual statutory salary was £266 (Durham Dean and Chapter Treasurer's Book, 1579–1580, no. 2; *ibid.*, 1580–1581, no. 3). The inventory lists perquisites.

[26] These figures regarding leases represent in all probability the value of the lease for the time still remaining before expiration, not the total value of or income from the holding.

[27] Saltfleetsby, in Lincolnshire near Wilson's Strubby homestead. Wilson's name was involved in many land transactions in Lincolnshire during the 1570's (*cf.* P.R.O. Close and Patent Rolls, *passim*). Lincolnshire holdings were also noted in the Inquisition Post Mortem and Court of Wards references in footnote No. 2.

[28] Not mentioned elsewhere.

GLOSSARY

Aggett: Agate.
Arminge Swordes: Arming swords.
Asia Ortellia: A map of Asia by Abraham Ortellius (1527–1598), next to Mercator the greatest geographer of his age, a close friend of Arius Montanus, Spanish humanist whom Wilson knew in Low Countries.
Bayes: Bays, a fabric introduced into England by French and Dutch refugees in the sixteenth century. A coarse woolen stuff used for linings, coverings. Became finer in the sixteenth century.
Beech Pillows: unknown.
Buckeram: Buckram, a coarse cotton cloth.
Budge: A kind of fur consisting of lamb's skin with the wool dressed outwards.
Butt: A large cask measuring about two hogsheads or about 130 U. S. gallons.
Cadoe: Caddis, a rough woolen flannel.
Callicow: Calico, white cotton cloth. General name for cotton cloth imported from East, i.e., from Calicut on the Malibar coast.
Canvas: Heavy, natural-colored, coarsely woven cotton.
Carnac[i]on: Carnation, shade of red—deep, dark red.
Closter: Cloister. Although normally associated with a religious house, it is a term also applied to any covered walk circumventing an open court or building.
Collaper: Calaber, a kind of fur, apparently from some foreign species of squirrel.
Coney: A young rabbit.
Conye case of Eboine: Coin case of ebony.
Corsletts: Corslet, a piece of defensive armor covering the body.
Courte: "Court" means "best" as opposed to ordinary furniture used by lower classes; *cf.* court stool, court cupboard.
Courte Cupbord: Court cupboard, a movable sideboard or cabinet used for display of plate.
Coverpane: Coverpan, a cloth covering.
Creatia Mundi: Probably a picture depicting the creation of the world.
Crewell: Crewel, a thin worsted yarn of two threads, used for tapestry and embroidery.
Cullendar: Colander, strainer.
Cupbord Cloth: Cupboard cloth, cloth used for display of plate.
Curetts—pofe (?): Cuirass of proof, a piece of armor for body. In this case proved in battle.
Cypress: A light, transparent material of silk and linen; also a hard wood of reddish color, indigenous to Persia and the Levant.
Dagg: Either a dagger, pistol or hand-gun. In this case, daggers.
Damask: Heavy silk material, woven with similar or contrasting colors in intricate designs, extremely expensive.
Danske Table: Dansk, or Danish table.
Dealebordes: Dealboard, a thin board of fir or pine.
Dernix: Dornick, a silk, worsted, woolen or partly woolen fabric used for hangings, vestments, carpets.
Diaper: A fabric, usually linen, woven with diamond-wise patterns with the spaces filled with decorations.
Dublet: Doublet, garment corresponding to woman's bodice, cut to fit closely to the skin.
Duraunce: Durance, a stout, durable cloth.
Ells: Distance from elbow to wrist or fingertips.
Ewer and basin: Used at meals; some were of exquisite workmanship.
Ewrope Macatoius: Probably Mercator's map of Europe, first published in 1554.
Ferritt Silke: Ferret silk, a stout tape made of cotton or silk.
Field Bed: A portable or folding bed chiefly for use in the field.
Flanders Cheste: A chest from the Low Countries.
Foote Pace: Foot pace, either a carpet or mat.
Form: A long seat without a back, a bench.
Frame: Perhaps shortened form for a lace or stocking frame; a frame for weaving or embroidery.
Frame of Beaes: Not clear, possibly "bars" or "beechwood."
Frize: Frieze, a woolen cloth.
Fustian: A velure of cotton so silky-looking that it is substituted for velvet.
Gallery: An essential feature of all Elizabethan houses; always many times longer than wide and used for exercise or music.
Gelde: Gold or possibly simply money.
Genealoge Regum Anglie: A genealogy of English royalty.
Great hall: Used usually for eating purposes.
Grogaron: Grogram, a coarse fabric of silk, of mohair and wool, or these mixed with silk.
Guards: Bands of material laid on or edging garments.
Hartechokes: Artichoke, name of the decoration embroidered on cushions, i.e., the heads of the edible artichoke.
Haselborough: Hazebrouck, town in northern France, famous for manufacture of cotton and linen cloth. In this case: reference to cloth from that town.
Haulbert: Halberd.
Head Sheete: Headsheet.
Holland: Oatmeal-colored linen.
Iron Back: Fire back, made of iron to prevent the heat of fire from destroying brickwork of chimney.
Jerkin: Garment worn over doublet.
Joined: As distinguished from trestle forms.
Kerches: Curch, a covering for the head. A kerchief.
Lockerum: Lockram, a coarse, cheap linen.
Mantle: A kind of woolen cloth or a blanket of this material.
Marten: Marten, fur-bearing animal.
Meyld: Melled, mixed.
Munes Macatous: Probably a map of the world by the celebrated Flemish mathmetician and geographer or map-maker, Gerardus Mercator (1512–1594). His map of the world first appeared in 1538.
Muneus Silvia: Possibly a picture of a wall with trees around it.
Murrey: Murry, purple-red or blood color.
Musterd Querne: Mustard querne, a hand mill for grinding mustard.
Paines: A kind of cloth resembling velvet.
Parlor: Usually the family room.
Partizanes: Partisans, long-handled spear comparable to the halberd.
Pasemen: Passement, gold or silver lace for decorating trimming.
Paynted Cloth: Painted cloth, a form of wall hanging used as a substitute for more costly tapestry.

Pestle: An implement, usually club-shaped, for pounding substances in a mortar.
Picture of Poeticall Devise: "Devises" refer to painted mottoes, heraldic charges or as in this case a verse or couplet.
Picture of Suzanna: Fairly common inclusion in sixteenth-century inventories.
Pillowbeares: Pillowbers, pillowcases.
Pootes: Poot, referring to the young of any breed.
Porled: (pearled?).
Porringers: Dishes for porridge or similar food.
Possenet: Posnet, a small metal pot or vessel for boiling. Has a handle and three feet.
Potle: Pottle, measure—2 qts.
Pottinger: Vessel for soups or other liquids.
Pume Garnet: Pomegranate.
Rangs: Range, fireplace or cooking apparatus.
Rash: Silk, satin, or fine serge.
Regolls: Regals, a reed stop in an organ or virginal.
Sarcenet Sweete Bagges: Sarsenet, a very fine and soft material made both plain and twilled and used mainly for linings. Sweet bags were filled with spices and used for cosmetics.
Saye: Say, a soft, light, finely twilled fabric made in both silk and wool.
Scarlet Dreste: Vivid yellow-red color or a very fine woolen broadcloth.
Secke: Sack, the generic name for Spanish and Canary wines.
Settle: A long wooden bench, usually with arms and high back.
Skinner: Skimmer (?).
Spanish Chayrs: A Spanish chair very probably obtained in the Netherlands.
Spanish Ladye: Spanish Lady, probably a picture.
Standish: An ink stand.
Steales: Steals, the handle of a tool or utensil.
Still of Tynne: Still of tin.
Stomachers: Ornamental protection for abdomen (men and women).
Strawne: Strawed? or straw (obs.).
Stuffe: Stuff, defensive armor; quilted material worn under mail.
Teaster: Tester, vertical part of bed behind head or a canopy over the head supported by posts.
Till: A tray, box, drawer in a chest or trunk, used frequently for valuables.
Tornall Tyke: Tournai tick, i.e., bedtick made at Tournai (Flemish: Dornick).
Trucklebed: Truckle or trondle bed or trundle bedstead.
Tufte Mockadoe: Tuft mockado, a kind of cloth, imitation velvet, used for clothing in the sixteenth century.
Turkey Carpet: A needlework imitation of an Eastern carpet.
Twelve Philosophers: Either pictures or sculptured works, probably the former.
Tyssew: Tissue, metal and silk, semi-transparent material.
Vallaunce: Valance, a hanging drapery as for a bedstead.
Virginalls: Virginal, a keyed musical instrument.
Vushorne: Vushorn, the soft, downy skin which covers a deer's horn in the growing state.
Wainscot: A superior quality of foreign oak imported from Russia, Germany and Holland, chiefly used for fine panel work and furniture.
Walter Flowers: Water flowers.
Walter: Water.
Well: Welt, a narrow strip of material put on the edge of a garment as a border.
Widow of Venice: Probably a picture.
Woodmall Blanket: Unknown.
Yron Creepers: Iron creepers, a small iron "dog" of which a pair were placed on a hearth between the andirons.
Yron Rackes: Iron racks, a set of bars, as for a spit for roasting.

SOME PHONETIC ASPECTS OF WORD ORDER PATTERNS IN LATIN

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INTRODUCTION

THIS is an historical study. Its purpose is to ascertain certain facts and classes of facts about the way in which the native Latin speaker of the classical period spoke his language. We would gladly know all we could on this topic, but the areas of our information are greatly limited by the nature and extent of the available evidence. My primary concern is to present that evidence fairly and adequately; but the fragmentary nature of the evidence itself requires at times a certain devious and almost tortuous mode of presentation. For this, I must ask the reader's indulgence. The results we shall arrive at are, I believe, of active concern to all who make use in any way of the Latin language. I have been reluctant to address myself solely to professional Latin grammarians or even to Latinists alone, since knowledge of the type of facts we are dealing with and of the kind of evidence we have for those facts can prove of value to the students of any language when our knowledge of it depends wholly or primarily on the written record. Similar studies can immeasurably enrich our knowledge of ancient Greek, of early Romance languages, and of others. And, when such studies have been made, application of comparative methods also promises fruitful results.

Two previous publications have dealt with some of the topics here discussed. They are: "Some principles of Latin phrasing: Quintilian 11. 3. 35–38 on Aeneid 1. 1–3," *Classical Weekly* **47**: 17–22, 1953; and "Latin word order: The *status quaestionis*," *Year Book of the American Philosophical Society* for 1954: 360–370, 1955. For the convenience of the reader I repeat enough of the essential material from these two papers to obviate the need to consult them in order to follow the argument.

The principal texts on which the following argument is based are either translated or paraphrased. For permission to use translations I am indebted to Professor Harry Hubbell for Cicero's *Orator*, to Professor Harry Caplan for the Auctor ad Herennium, and to the Harvard University Press, publishers of the Loeb Classical Library, for similar permission in the case of both of these translations. In other instances, unless the name of a translator is given, the versions are my own. I am grateful to an anonymous referee for some improvements in these translations.

I also wish here to express my gratitude to the American Philosophical Society for the grant which made it possible for me to collect and study the varied technical literature on the subject of word order in Latin.

I. SOME PHONETIC FACTORS IN LATIN SPEECH

The thesis of this study is that there is a correlation between certain phonetic factors which were characteristic of Latin speech and other linguistic factors which can conveniently be described in terms of patterns of word order.

The only phonetic factors in Latin speech which have received thorough study in the technical literature on Latin grammar are those customarily treated under the heading of phonology, which in layman's language we may say has dealt with the sounds of the letters. Our first task will be to assemble such evidence as seems to be available on what one may call the non-alphabetic aspects of Latin speech. In the process of collecting and presenting this evidence, we shall naturally also study the examples cited in our ancient sources. And, if we find, as I believe we shall, that certain linguistic and phonetic factors regularly occur together, the thesis itself will be established. In fact, however, the thesis is easy to prove in a general way; my primary interest here is to develop and illustrate it in such a way that it can be a useful tool for the better understanding of extant works of literature in classical Latin.

One of the valuable developments in Latin studies in recent years has been the increasing emphasis given to problems of adequate oral reading of classical Latin literary texts. One feature of this emphasis has been a widespread attempt to pronounce Latin words as correctly as possible according to the best information that can be had about the precise sounds represented by the

graphic symbols of the ancient Latin alphabet. However, as we all know, there is a great deal more to speaking or reading aloud than accurate phonetic pronunciation of letters and even of words. It is possible for speech to be intelligible even when individual sounds or words are notably mispronounced provided the speaker employs the basic patterns of intonation and cadence for phrases and sentences in the language, as anyone knows who has spent much time with small children. On the other hand, speech is often quite unintelligible when the patterns of intonation and cadence of another language are employed, even though individual sounds and words are pronounced with reasonable accuracy. This is a difficulty which constantly confronts adults trying to master a second language.

My purpose in mentioning this contrast is to illustrate a simple distinction between two types of phonetic factors which characterize speech in a language. As I have suggested, one might use the terms alphabetic and non-alphabetic factors as a rough means of describing the two types. In general, alphabetic phonetic factors in Latin have been the subject of prolonged, accurate, and fruitful study. On common sense grounds, therefore, there is reason for some astonishment at the almost complete dearth of any formal study of other sorts of phonetic factors in Latin speech. The reason is probably not a lack of interest but rather a combination of man's two most insidious vices, presumption and despair.

In part, we have not sought for these phonetic factors in our available sources, because we have presumed that, since Latin was a normal language spoken by normal people, they probably used the same cadences and intonations that we do in speaking our own language. The fact that Latin has never, until quite recently, been regarded in the Western European tradition as a foreign language has probably operated quite strongly in reinforcing this presumption. If, at times, one wished to question the adequacy of this transfer of techniques of utterance from one language to another, he might easily despair of being able truly to talk as the Romans and other Latin speaking people did. The temptation to despair would be all the stronger, the higher the ideal of accuracy was set. Since we know that our attempts to pronounce even the sounds represented by the letters and words of Latin fall short of our scientific knowledge of ancient pronunciation, we might well feel discouraged in any attempt to master the intonations and cadences of Latin phrases and sentences. But we can now pronounce Latin words more accurately than was customary when the so-called national pronunciations prevailed (especially the English pronunciation); and with a reasonable amount of factual information to use as a basis we can also improve and correct our intonation, cadence, and other non-alphabetical aspects of utterance. In so doing, we shall find that a whole new dimension of classical Latin literature becomes available to our understanding and appreciation.

After all, the source of our despair was the feeling that we had to know everything in order to know something. This assumption is false. The reason I have introduced the expression "phonetic factor" is that it gives us something in terms of which we can phrase our partial knowledge. Granted that we know that two linguistic items did not sound exactly alike, we can say that they differed in respect to some phonetic factor, although we may not be able to describe or to define that factor accurately. And still we know more than we did before we recognized the existence of the factor at all.

The concept of a phonetic factor of this sort is not entirely new in Latin grammar. Some sixty years ago, J. B. Greenough, discussing certain conditional constructions in Latin and Greek where the same form of words is used to express two opposite meanings, suggested that certain phonetic factors in delivery other than the words themselves served to distinguish the two constructions. He supported his suggestion by a parallel from English, adding:[1]

> We have very little information as to the tone-inflexions of Greek or Latin speech, but we may be sure that they were not less in extent and variety than those of our own. Without concluding at all that the difference between the two forms of speech was the same in those languages as in our own, it seems to me almost certain that they were similar and served precisely the same purpose.

The point that interests us now is the suggestion that there are significant phonetic factors in Latin speech other than those which customarily receive graphic representation.

Greenough made his suggestion as a means of solving a particular grammatical problem. Somewhat similar to this is the occasional discussion of a crux in the text of some classical author, where a special mode of delivery is developed that per-

[1] Greenough, J. B., Some features of the contrary to fact construction, *Harvard Studies in Class. Philol.* 7: 13–20, 1896, especially p. 17.

mits adequate projection of meaning using the words of the text as they stand.[2] But intonation, cadences, pauses, and the rest do not occur only when there is a problem to be solved. They are part of normal utterance and occur all the time. We must try to understand them as normal features of all Latin speech.

To indicate both the problem and the method I propose to use in solving it, we may take the distinction between two types of question as it is discussed by Augustine, *De doctr. chr.* 3. 3. 6:

nisi enim fides revocet, qua credimus Deum non accusaturum adversus electos suos et Christum non condemnaturum electos suos, potest illud sic pronuntiari: "quis accusabit adversus electos Dei?", ut hanc interrogationem quasi responsio subsequatur: "Deus qui iustificat," et iterum interrogetur: "quis est, qui condemnat?", et respondeatur: "Christus Iesus, qui mortuus est." quod credere quia dementissimum est, ita pronuntiabitur, ut praecedat percontatio sequatur interrogatio. inter percontationem autem et interrogationem hoc veteres interesse dixerunt, quod ad percontationem multa responderi possunt, ad interrogationem vero aut "non" aut "etiam." pronuntiabitur ergo ita, ut post percontationem qua dicimus "quis accusabit adversus electos Dei?" illud quod sequitur sono interrogantis enuntietur: "Deus qui iustificat?", ut tacite respondeatur "non"; et item percontemur: "quis est qui condemnat?" rursusque interrogemus: "Christus Iesus, qui mortuus est, magis autem qui resurrexit, qui est in dextera Dei, qui et interpellat pro nobis?," ut ubique tacite respondeatur: "non." at vero in illo locō ubi ait: "quid ergo dicemus? quia gentes quae non sectabantur iustitiam apprehenderunt iustitiam," nisi post percontationem, qua dictum est "quid ergo dicemus?," responsio subiciatur: "quia gentes quae non sectabantur iustitiam apprehenderunt iustitiam," textus consequens non cohaerebit. qualibet autem voce pronuntietur illud quod Nathanahel dixit: "a Nazareth potest aliquid boni esse," sive affirmantis, ut illud solum ad interrogationem pertineat, quod ait "a Nazareth?," sive totum cum dubitatione interrogantis, non video quomodo discernatur. uterque autem sensus fidem non impedit.

For example, if our faith that God will not bring any charges against His elect, and that Christ will not condemn His elect, did not stand in the way, this passage, "Who shall lay anything to the charge of God's elect?" might be pronounced in such a way as to make what follows an answer to this question, "God who justifieth," and to make a second question, "Who is he that condemneth?" with the answer, "Christ Jesus who died." But as it would be the height of madness to believe this, the passage will be pronounced in such a way as to make the first part a question of inquiry, and the second a rhetorical interrogative. Now the ancients said that the difference between an inquiry and an interrogative was this, that an inquiry admits of many answers, but to an interrogative the answer must be either "No" or "Yes." The passage will be pronounced, then, in such a way that after the inquiry, "Who shall lay anything to the charge of God's elect?" what follows will be put as an interrogative: "Shall God who justifieth?"—the answer "No" being understood. And in the same way we shall have the inquiry, "Who is he that condemneth?" and the answer here again in the form of an interrogative, "Is it Christ who died? yea, rather, who is risen again? who is even at the right hand of God? who also maketh intercession for us?"—the answer "No" being understood to every one of these questions. On the other hand, in that passage where the apostle says, "What shall we say then? That the Gentiles, which followed not after righteousness have attained to righteousness;" unless after the inquiry, "What shall we say then?" what follows were given as the answer to this question: "That the Gentiles, which followed not after righteousness, have attained to righteousness;" it would not be in harmony with the succeeding context. But with whatever tone of voice one may choose to pronounce that saying of Nathanael's "Can any good thing come out of Nazareth?"—whether with that of a man who gives an affirmative answer, so that "out of Nazareth" is the only part that belongs to the interrogation, or with that of a man who asks the whole question with doubt and hesitation—I do not see how a difference can be made. But neither sense is opposed to faith. (Transl. J. F. Shaw.)

This passage could serve to establish a number of linguistic distinctions marked by *pronuntiatio* in Latin. In the first part, Augustine distinguishes question and answer (*interrogatio* and *responsio*). Then, he mentions two kinds of question (*percontatio* and *interrogatio*). It is interesting that these terms are so well recognized that Augustine uses the word *interrogatio* here in two quite different senses without difficulty. Shaw's translation "rhetorical interrogative" for *interrogatio* in the second sense seems to imply a difference of delivery between ordinary "yes and no" questions and rhetorical questions; but Augustine's language does not support this interpretation. In the last part of the passage, Augustine also distinguishes between two modes of delivery for the quotation from John 1: 46 (a Nazareth etc.). All of these different types of *pronuntiatio* deserve careful study as characteristic features of

[2] For example, Alexander, William Hardy, *Aeneid* I, 462: a new approach, *Amer. Jour. Philol.* **75**: 395–400, 1954.

Latin speech; but for our present purpose I wish to confine my attention to two points. First, there are in Latin two types of question (*percontatio* and *interrogatio*), which are distinguished in speech by some phonetic factor or factors, although they do not differ in their graphic form. And, second, we now have no way of defining or describing the precise phonetic factor or factors by means of which the distinction was made. For practical purposes we might have to designate them in some perfectly arbitrary way (e.g., by the symbols F1 and F2); but the existence of these factors and their linguistic force is just as clear as it would be if we could describe them phonetically. One further point deserves notice. Here we can base our linguistic analysis on the specific testimony of a native Latin speaker about a feature of his own language. But we could have arrived at the same conclusions solely on the basis of careful study of the written record of classical Latin literary texts. We could have assembled a large number of examples of questions in our texts, and putting them side by side we could have proven that the principle of intelligibility requires one to assume that there are two forms of question in Latin which must have been distinguished in actual speech by some difference in the phonetic factors employed in uttering them. We still could have been confident of the existence of the distinction, although we might have no clue to its precise phonetic character.

My primary purpose in this study is to present such evidence as seems to be available relating to another set of phonetic factors which we can identify in classical Latin. It seemed essential, however, to establish in the first place that there were significant non-alphabetic phonetic factors in classical Latin utterance and that we can identify and at least in part describe them by two means. These two means are briefly: contrast and specific evidence. The term contrast as I use it here needs a word of explanation. I mean in effect the same thing as the professional students of linguistics mean by the term, but the devices available to us for establishing contrast are necessarily different, since they must be adapted to the existing written record of classical Latin. The written record contains all the facts we have; we must use it as an informant. When a sequence of words in written form can have two different grammatical functions and two different meanings, the words are either completely ambiguous in themselves or they are distinguished in actual speech by some phonetic factor which does not receive graphic representation. In the first case, the ambiguity is usually purely formal and can be readily resolved by examination of the context. Some ambiguities occur in Latin which cannot be so resolved, but the certain cases seem to be quite rare. Augustine cites such an example from the Latin translation of St. Paul (*De doctr. chr.* 3. 4. 8):

> Non solum autem istae sed etiam illae ambiguitates, quae non ad distinctionem vel ad pronuntiationem pertinent, similiter considerandae sunt. qualis illa est ad Thessalonicenses: "propterea consolati sumus fratres in vobis." dubium est enim utrum "o fratres" an "hos fratres." neutrum autem horum est contra fidem.

> The above principles also apply to ambiguities which cannot be resolved by *distinctio* or *pronuntiatio*, as, for example, in the Epistle to the Thessalonians: . . . It is doubtful whether "fratres" is vocative or accusative. But neither is against faith.

Here the word "fratres" is ambiguous not only in the written form but also in the spoken form of the language. Another and more famous example of true ambiguity of this sort is the line of Ennius (*Ann.* 179 Vahlen): Aio te Aeacida Romanos vincere posse. No linguistic test applied to the written or spoken form of this line suffices to determine which of the two accusatives is the subject of "posse" and which is the object of "vincere." Indeed, this complete ambiguity is essential to the line in its original context.

However, very many of the visual ambiguities of Latin were not at all ambiguous in actual speech, since they were naturally and necessarily resolved by *distinctio* or *pronuntiatio*. Consequently, they were not really ambiguous to the native Latin speaker who was familiar with the linguistic patterns of Latin speech. My first proof of this proposition is based simply on common sense. Common sense tells us that the distinction between subject and predicate or between attributive and predicate uses of the adjective is important in Latin and that the speakers of the language could not and did not tolerate a system of complete ambiguity in utterance for these linguistic features. Since they did not use position or an article or other word to mark this distinction, since in fact there is no graphic representation of the distinction, one is justified in assuming that it was marked by the presence or absence of some phonetic factor in actual speech or utterance. Such an argument based wholly on common sense considerations can be only partially persuasive;

but, if it can be supported even in part by some specific evidence or testimony of an ancient native speaker of the language, it can be accepted with confidence. In the case of the attributive and predicate uses of the adjective we have corroborating evidence in a passage of Cicero; and we can extend this corroboration to the parallel case of substantive subjects and predicates. Since the phonetic factor involved in this distinction does not appear to be a *distinctio*, it must fall under the classification of *pronuntiatio* (in Augustine's terminology). The key words in the passage of Cicero (*Tusc.* 1. 13–14) [3] are as follows (14):

> cum igitur dicis "miser M. Crassus," aut hoc dicis "miser est Crassus," ut possit iudicari verum id falsumne sit, aut nihil dicis omnino.

Either the words "miser M. Crassus" mean the same as "miser est Crassus" or they are not a statement at all.

Two interpretations are possible. (1) The words "miser M. Crassus" are completely ambiguous in normal utterance; they may be either (*a*) a statement (i.e., "miser" is predicate) or (*b*) the possible subject of some unexpressed predicate (i.e., "miser" is attributive). (2) The words are not completely ambiguous as uttered, and the distinction between *a* and *b* above (aut hoc dicis . . . aut nihil dicis omnino) is marked by the technique of utterance employed. Cicero's language does not permit us to arrive at a certain choice between these alternatives. However, the first seems to fit the context less well than the second, since the other speaker immediately abandons his position (age, iam concedo etc.). I prefer the second alternative because, as I have said above, we know that some apparently ambiguous expressions were kept distinct by the way in which the words were spoken (see also Quint. 7. 9. 7–11), and there is no evidence that Latin speakers were troubled by any possible ambiguity in attributive and predicate uses of the adjective.

Certain other phonetic factors in Latin utterance can also be discovered by use of the method just described, which combines the concept of contrast with the explicit evidence of a Latin speaker about his own techniques of utterance. Three such factors are mentioned in Quintilian's discussion of the proper way to read the opening lines of the *Aeneid* (see below pp. 490–491). Common to all three factors as Quintilian describes them is the idea of "pause"; and the pauses come in three sizes: small, medium, and large. The standard size is the medium, which is regularly called *distinctio*. In all three, a phonetic factor is involved; it indicates that what follows does not go as closely and consecutively with what precedes it as would be the case if the factor did not occur. One term for the absence of such a factor is *continuatio*. Quintilian analyzes the distinction between *continuatio* and *distinctio* (in all its varieties) in terms of linguistic structure formulated in grammatical terms. And in fact there seems to be a close correlation between linguistic structure and the phonetic factors involved in *continuatio* and *distinctio*. We can consequently approach the study of the one in terms of the other.

Two of the three factors are actually quite easy to identify. In general, *distinctio* marks the place in connected discourse where a complete sentence ends. Phonetically, as Quintilian says, the mark is a falling inflection or pitch contour and a real or potential pause in the flow of speech. The *distinctio* or phonetic mark of division between sentences is quite similar to the type of mark found at (*Aen.* 1. 7) "atque altae moenia Romae," except that here the pause is longer, according to Quintilian, and it is followed by a "new beginning." In the following line, there is a change of subject, asyndeton, and a new topic. These, presumably, are other linguistic marks of the large *distinctio* Quintilian says occurs here.

The ordinary *distinctio* is in some ways the most troublesome factor to locate with certainty in the written record of Latin discourse. This is well illustrated by the fact that placing of suitable written marks for *distinctiones* was regarded as a professional job when manuscript books were written in *scriptura continua*. The principles are simple enough, but the grammatical and rhetorical structure of Latin is such that at times some kind of question arises as to where a sentence or a major part of a sentence ends. In the strictest sense this is a grammatical rather than a linguistic problem since it arises from the nature of the written record; no one need wonder where a sentence ends if he can hear it read or spoken aloud by someone who understands and projects the meaning. The principle is that a *distinctio* and its accompanying phonetic factors occur at the end of a sentence. A convincing indication of such a sentence end according to Quintilian is the beginning of a new sentence. Augustine gives

[3] See my review of Whatmough, Joshua, *Poetic, scientific and other forms of discourse*, Berkeley and Los Angeles, University of California Press, 1956, in *Classical Philology* **52**: 252–256, 1957.

rules for the resolution of ambiguities or doubtful instances. Internally, however, the normal grammatical and rhetorical structure of Latin also causes the end of a Latin sentence to be marked in another way, that is, by the fact that all the formal grammatical expectations that have been aroused have been satisfied.

The third type of *distinctio*, the small one or *subdistinctio*, is the one with which we shall be primarily concerned later in this study.

II. *ARS GRAMMATICA* AND *ENARRATIO*

The art of grammar, according to Quintilian (1. 4. 2–3), is divided into two parts: the science of speaking correctly and the interpretation of the poets (recte loquendi scientiam et poetarum enarrationem). But there is more in these definitions than meets the eye (plus habet in recessu quam fronte promittit). Writing is closely connected with speaking (nam et scribendi ratio coniuncta cum loquendi est), and correct oral reading is a necessary condition for interpretation (et enarrationem praecedit emendata lectio).

The division of the art of grammar that deals with the science of speaking and writing correctly has been very extensively cultivated and developed in Latin scholarship. It involves study of canons of style and usage, whether applied to composition and the formation of one's own Latin style or to the recension and emendation of texts. It has dominated the kind of study we usually call historical grammar not only in such obvious areas as phonology and morphology but also in the study of syntax, where interest centers on the specific conditions under which a usage or a locution originated or achieved status as normal and socially acceptable. One can have no quarrel with this kind of grammatical study. I mention it here primarily to call attention to the type of thing we shall not be directly concerned with in this study.

Our interest lies in the second main division of the art of grammar, which is traditionally referred to as *enarratio poetarum*, although, as Quintilian says (1. 4. 4; *cf.* 1. 9. 1 enarratio auctorum), it can easily be extended and I do extend it to include the interpretation of all works of literature. This branch of the art of grammar is practiced continually in the classroom. Its most characteristic form of publication is the exegetical commentary, although it includes much else. However, students of Latin literature have paid little attention to Quintilian's prescription of correct oral reading (emendata lectio) as a prerequisite for exegesis (enarratio).

The most obvious reason for this neglect is clearly the difficulty of dealing with the subject, especially in writing. Quintilian himself recognizes this difficulty and states the problem of reading as follows (Quint. 1. 8. 1–2):

> Superest lectio: in qua puer ut sciat ubi suspendere spiritum debeat quo loco versum distinguere, ubi claudatur sensus unde incipiat, quando attollenda vel submittenda sit vox, quo quidque [quid quoque *codd.*] flexu, quid lentius celerius, concitatius lenius dicendum demonstrari nisi in opere ipso non potest. unum est igitur quod in hac parte praecipiam: ut omnia ista facere possit, intellegat.

> The next topic is reading. The pupil must learn where to sustain his breath, where to make a break in a verse, where a sentence comes to a close and where it begins, when he should raise or lower his voice, what tone of voice to use for each part, where to go faster or slower, or to use a more lively or a grave tone. All this can be shown only by doing it. There is just one point I would make here. To do all this, he must understand what he is reading.

Expressive oral reading, then, is an essential prior condition for interpretation; and the first points Quintilian mentions under reading are what I call phrasing, that is to say, putting together into one unit of utterance those words that belong together linguistically and indicating the interrelations of successive units of utterance or phrases by either dropping or not dropping the voice. For these last two items, Quintilian elsewhere (11. 3. 35) uses the terms *deponendus* and *suspendendus* respectively.

As I have said, my thesis in this study is that there is an intimate and necessary connection between the order of words as we actually find them in our Latin texts and the techniques of utterance by which those words are to be given adequate and expressive oral interpretation. This connection probably exists in greater or less degree between word order and all those aspects of delivery which Quintilian mentions, but it is most obvious and accessible to us in relation to what I have called phrasing. It is consequently my intention to explore the relationship between word order and phrasing first. One may hope that it will provide a means of getting at other aspects of delivery also. As I have said elsewhere,[4] "the text of an ancient Latin book should be regarded in much the same way as an unedited musical score. It is up to the reader to supply dynamics, tempo, phrasing, expression, and similar elements of interpreta-

[4] *Class. Weekly* **47**: 21, 1953.

tion." In the ancient tradition of the *ars grammatica* the commentator provides notes on such matters (e.g., Servius and Donatus *passim*), but the practice is not normal in modern commentaries.

The topic of word order in Latin is one which has been attacked from a number of different points of view.[5] Some of these seem to be in more or less flat contradiction to specific statements of ancient authors on the subject.

One widely accepted maxim was made popular by Henri Weil; it is that the order of words in Latin is the order of ideas. If this means the order in which the ideas expressed come to the listener, it is a truism; and even so it implies a very doubtful picture of all the words arriving in one continuous sequence as well as taking no account of the relationships expressed by means of inflections.[6] If, however, we are to understand that the order of words in a literary text represents the order of ideas to the speaker or writer, we have the express statement of Quintilian that such an order is frequently to be avoided. In discussing hyperbaton, he says (Quint. 8. 6. 62–64):

> Hyperbaton quoque, id est verbi transgressionem, quoniam frequenter ratio compositionis [comparationis *codd.*] et decor poscit, non immerito inter virtutes habemus. fit enim frequentissime aspera et dura et dissoluta et hians oratio, si ad necessitatem ordinis sui verba rediganturˌ et, ut quodque oritur, ita proximis, etiam si vinciri non potest, adligetur. differenda igitur quaedam et praesumenda, atque ut in structuris lapidum impolitorum [impolitor *codd.*], loco quo convenit quodque ponendum. non enim recidere ea nec polire possumus, quo coagmentata se magis iungant, sed utendum iis, qualia sunt, eligendaeque sedes. nec aliud potest sermonem facere numerosum quam opportuna ordinis permutatio.

Hyperbaton (i.e., the transposition of a word) is often required by the structure of the sentence or the demands of elegance and is consequently also included among the ornaments of style. For our style would constantly be harsh, rough, disjointed, and full of gaps if words were put down just as they come and each new word added to the one in front of it whether they can be made into a unit or not. Some words have to be postponed, others brought in in advance. It is just like building with rough stones; they have to be put where they will fit. We cannot chop them off or grind them down to make them fit together better, but we must use them just as they are and choose a place for them. Furthermore, it is impossible to employ rhythm except by using suitable variations in word order.

According to Quintilian, then, the order of words often ought not to represent the order in which the ideas they express occur to the speaker or writer. As for the composition as a whole, Quintilian says (7. 1. 25): primum enim occurrit fere, quod est ultimum dicendum (the first thing that comes to mind is practically always to be put last). A not dissimilar principle seems to apply to the matter of word order.

This is a good place to draw a very important distinction between the art of literary interpretation (part of the *ars grammatica*) and the art of rhetoric. The basic point of view of the art of rhetoric is well shown in the passages just quoted from Quintilian. Rhetoric considers language from the point of view of the speaker or writer, who is conceived to have certain gross elements of meaning he wishes to express and to be seeking the most desirable linguistic means for giving them effective expression (Quint. 8 praef. 15: eloqui enim est omnia quae mente conceperis promere atque ad audientes perferre). In the matter of language, rhetoric starts from a given meaning and considers alternative modes of expression. Grammar on the other hand, as the art of literary interpretation, starts from the specific words of a text and considers alternative interpretations. But the one is not the mere reverse of the other. This is clearly seen in the different senses in which one uses the word "meaning" with reference to the two arts. One of the purposes of rhetoric is to teach one how to say the same thing in different ways (Quint. 10. 5. 5: neque adeo ieiunam ac pauperem natura eloquentiam fecit, ut una de re bene dici nisi semel non possit). But in interpretation one does not seek the gross elements of meaning with which a speaker or writer began, but rather the precise and full significance of what he finally chose to say in the precise form and context in

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[5] See my report, Latin word order: the *status quaestionis*, *Year Book of Amer. Philos. Soc.* for 1954: 360–370, 1955. In the following discussion reference is made to: Weil, Henri, *De l'ordre des mots dans les langues anciennes comparées aux langues modernes: question de grammaire générale*, 3d ed., Paris, Vieweg, 1879. Stevens, Edward B., Uses of hyperbaton in Latin poetry, *Class. Weekly* **46**: 200–205, 1953. Jahn, Otto, *Neue Jahrbücher für Philologie und Paedagogik* **45**: 41–59, 1845. Kühner, Raphael, *Ausführliche Grammatik der lateinischen Sprache* **2** (*2*): 1063–1080, Hannover, Hahn, 1879. Marouzeau, J., *L'ordre des mots en latin: volume complémentaire avec exercices d'application et bibliographie*, Collection d'études latines, Série pédagogique **6**; Paris, Les Belles Lettres, 1953.

[6] For some complications involved in this point of view see my review of Whatmough's book (reference in note 3 above).

which he chose to say it. By its very nature, rhetoric is not and cannot be an art of interpretation; but it has techniques for referring to facts which are of great importance for interpretation. We shall make extensive use of the work of writers on the art of rhetoric in order to get at those facts.

So here, in the passage of Quintilian on hyperbaton, there are certain facts of importance for our purpose. When a writer uses the term hyperbaton he means that an expression occurs in such a position that one feels that another position for that expression would have been more ordinary or usual. This seems to imply a distinction between more or less normal or between normal and abnormal word position or word order in Latin.

Many writers on Latin word order have attempted to use this distinction as a tool for getting at the significance of patterns of word order.

One very popular form in which this distinction is phrased seems to have originated in the sixteenth century as a device of schoolmasters to teach boys to translate Latin. A full description of the system is reportedly to be found in the *Ludus Literarius* of John Brinsley first published in 1612.[7] Brinsley cites a number of predecessors, including Martin Crusius (1526–1607). According to this system, the Latin text to be translated is said to be in "artificial placing." By means of the "Golden Rule of Construing" the Latin is first rearranged in the order normal to modern European languages. This second is the "natural or grammatical order." With one modification, namely, that the verb is considered normally as final, these concepts of normal and rhetorical order were adopted by Otto Jahn, Raphael Kühner, and many others in the nineteenth century.

A similar distinction is employed by Jules Marouzeau, who, however, adopts from Abel Bergaigne the principle that there is no basic difference between the normal word patterns of classical Latin and those of modern French.[8]

All these attempts to attack problems of Latin word order in terms of a distinction between normal and abnormal order have two essential points in common. First, they define normal and abnormal in terms which go beyond purely Latin evidence; and, second and more important, they assume that some special significance attaches to a word or expression by the very fact that it is abnormally placed.

[7] Watson, Foster, *The English grammar schools to 1660: their curriculum and practice*, 349–356, Cambridge, at the University Press, 1908.

[8] Marouzeau (above note 5), page 1.

The second of these two principles, which is after all the key to the practical application of this approach for purposes of interpretation, seems to be called in question by a number of passages in Cicero and Quintilian. Cicero says (*Orator* 232–233):

> Quantum autem sit apte dicere, experiri licet, si aut compositi oratoris bene structam collocationem dissolvas permutatione verborum; corrumpatur enim tota res, ut et haec nostra in Corneliana et deinceps omnia: "Neque me divitiae movent, quibus omnis Africanos et Laelios multi venalicii mercatoresque superarunt"—immuta paululum, ut sit: "Multi superarunt mercatores venaliciique": perierit tota res. et quae secuntur: "Neque vestis aut caelatum aurum et argentum, quo nostros veteres Marcellos Maximosque multi eunuchi e Syria Aegyptoque vicerunt" verba permuta sic ut sit: "vicerunt eunuchi e Syria Aegyptoque." adde tertium: "Neque vero ornamenta ista villarum quibus L. Paulum et L. Mummium, qui rebus his urbem Italiamque omnem referserunt, ab aliquo video perfacile Deliaco aut Syro potuisse superari"—fac ita: "potuisse superari ab aliquo Syro aut Deliaco." (233) videsne ut ordine verborum paululum commutato, isdem tamen verbis stante sententia, ad nihilum omnia recidant, cum sint ex aptis dissoluta?
>
> The importance of well-knit speech may be demonstrated if you break up the well-ordered structure of a careful orator by changing the order of the words: the whole thing would be ruined, as, for example, in the following words from my *Defense of Cornelius* and the whole succeeding passage: "Neque me divitiae movent, quibus omnis Africanos et Laelios multi venalicii mercatoresque superarunt": change only a trifle, so that it reads "multi superarunt mercatores venaliciique," and the whole thing is spoiled. Take the next sentence: "Neque vestis aut caelatum aurum et argentum, quo nostros veteres Marcellos Maximosque multi eunuchi e Syria Aegyptoque vicerunt"; change this to "vicerunt eunuchi e Syria Aegyptoque"; add a third example: "Neque vero ornamenta ista villarum, quibus L. Paulum et L. Mummium, qui rebus his urbem Italiamque omnem referserunt, ab aliquo video perfacile Deliaco aut Syro potuisse superari": Write it as follows: "potuisse superari ab aliquo Syro aut Deliaco": (233) do you see that when the order of the words is slightly changed, though the words are the same and the thought is the same, the whole sentence collapses, when its symmetry is destroyed? (Transl. Hubbell.)

Cicero has in mind primarily here the rhythm of clausulae; but the principle stated in the words "isdem . . . verbis stante sententia" seems a pretty plain statement that no real differences of meaning

are involved in the examples cited. In another passage, which will be discussed in detail later (p. 498), Cicero discusses the effect of the rhythm of the clausula in the sentence "patris dictum sapiens temeritas fili comprobavit." He says (*Orator* 214–215):

> Verborum ordinem immuta, fac sic: "comprobavit fili temeritas": iam nihil erit, etsi temeritas ex tribus brevibus et longa est, quem Aristoteles ut optimum probat, a quo dissentio. "At eadem verba, eadem sententia." Animo istuc satis est, auribus non satis.
>
> Change the order of the words and write it this way: "comprobavit fili temeritas." The effect is now gone, although *temeritas* consists of three shorts and a long, the foot which Aristotle regards as the best; but I disagree. "The words, however, are the same, the thought is the same." That satisfies the mind, but not the ear. (Transl. Hubbell.)

Cicero's language in these two passages lends no support whatever to the belief that differences in the order of words are correlated with any differences in meaning, at least in the gross sense in which the rhetorician speaks of meaning. Indeed, the form of the expression "eadem verba, eadem sententia" when compared with "isdem . . . verbis stante sententia" suggests that this is a proverbial or at least a well-known maxim or principle. The same principle is stated by Quintilian as follows (Quint. 8. 6. 67): ubi nihil ex significatione mutatum est et structura sola variatur, figura potius verborum dici potest (when the transposition makes no alteration in the sense and merely produces a variation in the structure it is rather to be called a verbal figure. Transl. Butler).

Our ancient sources of information on patterns of word order in Latin seem to present us with a paradox. First, a number of statements by native Latin speakers distinctly imply that they felt there were proper places for words in Latin utterance. As evidence one might cite the term "rectus ordo" (Quint. 9. 4. 27) and indeed the whole concept of hyperbaton. Augustine in his account of how he learned to speak Latin as a child says that he heard "verba in variis sententiis locis suis posita" (*Conf.* 1. 8. 13). On the other hand, there is no evidence that I can find to show that ancient Latin speakers regarded variations of the sort illustrated in these passages we have quoted as affecting the meaning of the words involved in such variations.

If, however, we inquire of Cicero and Quintilian what differences they did perceive in two varying orders of words and in variations of word order in general, we find that they assert a number of times that the difference lies in the way the language sounds. Stated in this way perhaps this proposition may sound too grotesquely ordinary to be taken seriously. But I believe that we may find in it the key to the whole matter. Putting down words just as they come, says Quintilian, results in discourse which is "aspera et dura et dissoluta et hians." According to Cicero, a change of word order renders something (*Orator* 233) "aptum" which was before "diffluens ac solutum" or the reverse; and, in the other passage, Cicero says, "animo istuc satis est, auribus non satis."

I see no reason not to trust the considered judgment of Cicero and Quintilian on this very fundamental feature of Latin style and Latin usage. The order of words in Latin responds to the demands of euphony and rhythm, clarity and the avoidance of ambiguity, and many other things. It is the most important single linguistic feature relieving the otherwise notable poverty of expression the ancient writers felt as characteristic of the language. Indeed, it is Latin word order that makes Latin sound like Latin. We are not going to solve all the problems posed by word order in Latin all at once or by any one device or formula. But, in order to get at the matter at all we need some objectively established facts correlated with word order patterns so as to be able to make verifiable statements on the subject. I believe we can find those necessary facts in a number of specific statements by classical authors on the subject of phrasing. That a correlation of some sort exists between word order and phrasing is established by Quintilian's treatment of *Aen.* 1. 2 (see below). He says there is a pause or phrasing break before "fato profugus" and before "Lavinaque," because "fato profugus" is an *interiectio* and it breaks the continuity one would have had between "Italiam Lavinaque." Here we have a specific example of a connection between word order and phrasing in Latin; and Quintilian further provides us with two important concepts. They are: first, the concept of a phonetic factor of some sort which serves to mark the boundary of phrases, and, second, the concept of *continuus sermo*, i.e., the continuous flow of discourse or utterance which is the converse of the break between phrases. These are, however, precisely the matters which Quintilian mentions first in his discussion of *lectio*, namely, "ubi suspendere spiritum debeat, quo loco versum distinguere, ubi claudatur sensus unde incipiat."

III. REVIEW OF THE EVIDENCE OF CLASSICAL AUTHORS ON PHRASING

The pages which follow present passages in classical Latin authors which seem to contain positive and useful information on the topic of phrasing. Passages in the grammarians and other later Latin authors are excluded for purely practical reasons. There is enough evidence available from the classical period for our purposes; later authors apparently add to our information in details, but frequently they require so much explanation and elucidation that the positive results do not seem to justify their inclusion here. For the classical period my collection is as complete as possible, but I know from experience that a passage that may seem to contain no information for us at all can be made to yield valuable insights if it can be approached with precisely the right question in mind. I trust that such information as may be elicited from passages I do not discuss will serve rather to enlarge our knowledge than to force any essential correction of the conclusions to be drawn from the passages studied here.

A word should also be said on the matter of arrangement. It is difficult and perhaps undesirable to try to arrange the material in a rational order, for at least two reasons. First, the information we seek in these passages is often incidental to the author's main purpose, so that the reader would find it more difficult to verify conclusions if one tried to weave all the data into a single whole. Second, each passage stands by itself as containing a specific fact or facts, and no one of these facts depends for its validity on any one of the others. Each passage tells us that a native Latin speaker at a particular time and place read aloud or spoke a specific literary passage in such and such a way. The passage is quoted, and the manner of delivery either is described or can be inferred from what the native speaker says. He is consequently an "informant" in the technical sense of that term; perhaps not an ideal informant, but the best that we have and his information is very precious to us. Each Latin passage cited together with the information given on the techniques used to utter it constitutes part of our primary data on the techniques of Latin utterance. If we study each of these items in turn, inferring from the facts at hand the principles of utterance implicit in what is said, we shall have an opportunity to check the various pieces of data against one another. Such a procedure seems to promise the best hope of securing positive and verifiable information. It does however risk a certain amount of repetition, but I shall follow an order of convenience in presenting the passages to be studied so as to reduce repetition to a minimum.

Here it might be well to add that all the evidence for the techniques of utterance we are studying in Latin relates to formal delivery, for which the terms *lectio, emendata lectio, pronuntiatio, actio,* and *oratio* are used, and not to the more varied and difficult phenomena of conversational speech or *sermo*. Cicero seems to imply that one could recognize a noteworthy distinction between these two things. He says (*de orat.* 3. 41), nam de voce nondum ea dico quae sunt actionis sed hoc quod mihi cum sermone quasi coniunctum videtur. Quintilian draws a similar distinction between the techniques of utterance and delivery proper to the orator and those proper to the stage (Quint. 11. 3. 181–183; *cf.* 11. 3. 33–35). But the differences between these various techniques seem to be ones of degree rather than of kind. In any case, since almost all classical Latin available to us for study consists of formal literature rather than of conversational Latin, one may for practical purposes disregard any features peculiar only to the latter, if there be such.

Our review of the evidence on phrasing may most suitably begin with the passage in Quintilian which formed the basis of my first paper on this subject. I quote the passage in its entirety; no significant textural variants are recorded.

1. QUINT. 11. 3. 35–39.

Secundum est ut sit oratio distincta, id est ⟨ut⟩ qui dicit, et incipiat ubi oportet et desinat. observandum etiam, quo loco sustinendus et quasi suspendendus sermo sit, quod Graeci ὑποδιαστολήν vel ὑποστιγμήν vocant, quo deponendus. (36) suspenditur "arma virumque cano," quia illud "virum" ad sequentia pertinet, ut sit "virum Troiae qui primus ab oris," et hic iterum. nam etiam si aliud est, unde venit quam quo venit, non distinguendum tamen, quia utrumque eodem verbo continetur "venit." (37) tertio "Italiam," quia interiectio est "fato profugus" et continuum sermonem, qui faciebat "Italiam Lavinaque," dividit. ob eandemque causam quarto "profugus," deinde "Lavinaque venit litora," ubi iam erit distinctio, quia inde alius incipit sensus. sed in ipsis etiam distinctionibus tempus alias brevius, alias longius dabimus: interest enim sermonem finiant an sensum. (38) itaque illam distinctionem "litora" protinus altero spiritus initio insequar: cum illuc venero "atque altae moenia Romae," deponam et morabor et novum rursus exordium faciam. (39) sunt aliquando et sine respiratione quaedam morae etiam in periodis. ut ⟨enim⟩ illa "in coetu vero populi Romani negotium

publicum gerens magister equitum" et cetera multa membra habent (sensus enim sunt alii atque alii), sed unam circumductionem: ita paulum morandum in his intervallis, non interrumpendus est contextus. et e contrario spiritum interim recipere sine intellectu morae necesse est, quo loco quasi surripiendus est: alioqui si inscite recipiatur, non minus adferat obscuritatis quam vitiosa distinctio. virtus autem distinguendi fortasse sit parva, sine qua tamen esse nulla alia in agendo potest.

The second point is that utterance should be punctuated, that is, the speaker should start and stop where he ought. He must also observe where the flow of speech must be checked and as it were held in suspense (what the Greeks call hypodiastole or hypostigme) and where the voice should be dropped. (36) The words "arma virumque cano" are suspended, because the word "virum" has a connection with what follows, being antecedent of "qui" in "Troiae qui primus ab oris." This phrase is also suspended, because even though where he came from and where he came to are different, one should none the less not make a full stop because both depend upon the same verb "venit." (37) There is a third suspension after "Italiam," because "fato profugus" is parenthetical and breaks up the continuity one would have had in "Italiam Lavinaque." For the same reason, there is a fourth suspension at "profugus"; then, after the final phrase, "Lavinaque venit litora," there is a full stop, because another sentence begins. As for the full stops themselves also, some will be shorter and some longer; it makes a difference whether they end a unit of discourse or only a sentence. (38) Consequently, after the stop at "litora," I shall immediately proceed with a new breath; but when I come to "atque altae moenia Romae," I shall drop my voice, pause, and make a whole new start. (39) There are at times also some pauses unaccompanied by the taking of a new breath even in periods. For example, the passage of Cicero that begins "In coetu vero populi Romani negotium publicum gerens magister equitum" and so forth has many *cola*, since it consists of a number of sense units; but it is all one period. So one must pause a bit between the *cola*, but not break the unity of the period. Contrariwise, from time to time it is necessary to take breath without giving the impression of a pause. In such a case, one must so to speak breathe on the sly, because taking a breath unskilfully makes a person just as hard to understand as putting a stop in the wrong place would. The virtue of putting stops in the right places may seem trivial, but without it there can be no other virtues in delivery.

In the first part of this passage, Quintilian mentions two basic types of phonetic break in connected discourse. His terms "sustinendus" and "deponendus" correspond to the technical terms *subdistinctio* and *distinctio* respectively. From his use of word "etiam" in 37 (sed in ipsis etiam distinctionibus) one may infer that the qualification of being longer or shorter applies to both of these types of break. These two main types of phonetic break are provided for in the phonetic notation employed by certain modern students of aspects of language. They seem to correspond fairly well to the terms "sense groups" and "breath groups" used by Daniel Jones,[9] whose notation for them is | and || respectively. The same phenomena are also discussed by certain students of linguistics. H. A. Gleason[10] uses the terms "clause" for the units and "clause terminals" for the phonetic marks between units. His graphic symbols → and ↘ seem to correspond rather accurately to Quintilian's terms "suspendendus" and "deponendus." Both these sets of symbols are designed primarily to fit the techniques of utterance characteristic of modern English. Necessarily, they simplify and reduce to type an extremely complex set of phonetic facts.[11] No doubt the actual facts of ancient Latin utterance were just as complex as those of modern English; but the clear agreement between Jones and Gleason on the one hand and Quintilian on the other seems to justify one in following the lead of the modern analysts of English to this extent in analyzing Latin.

In terms of Jones' symbols we could represent Quintilian's analysis of the lines of Vergil as follows:

Arma virumque cano | Troiae qui primus ab oris |
Italiam | fato profugus | Lavinaque venit
litora ||.

His statement about *Aen.* 1. 7 can be represented as follows:

| atque altae moenia Romae ||.

If it were desirable, a different symbol instead of || could be used at the end of this line (e.g., |||); but I do not see that such a symbol would serve any useful purpose now. One could just as easily use Gleason's symbols, but they are more cumbersome. The break I have indicated before "atque" is inferred from the fact that Quintilian quotes this group of words as a unit. Strictly speaking this inference is not demonstrably necessary solely

[9] Jones, Daniel, *The pronunciation of English*, 144, Cambridge, at the University Press, 1950.

[10] Gleason, H. A., *An introduction to descriptive linguistics*, 46 and 138, New York, Holt, 1955.

[11] For a visual record of some actual facts one may consult Cowan, Milton, Pitch and intensity characteristics of stage speech, *Archives of Speech*, Supplement, Dec. 1936.

on the basis of what Quintilian says here; I rely in part on the principle stated elsewhere by him (Quint. 11. 3. 110 quia sequitur coniunctio, see below p. 494). However, every time that Quintilian quotes a few words in this way I would not say that in their original context such a group of words always constituted a phrase in the sense in which I am using the term. Each context must be examined, and in judging the matter one must usually use criteria that lie outside the specific language Quintilian uses in quoting the passage. For this reason, I have not attempted to make a full collection of such brief quotations in Quintilian, although one or two will be discussed later.

Only the first part of this passage in Quintilian was studied in the paper referred to above. For an analysis of the phrasing of the passage quoted from Cicero (*2 Phil.* 63), another passage in Quintilian is helpful (Quint. 8. 4. 8–9):

> crescit oratio minus aperte, sed nescio an hoc ipso efficacius, cum citra distinctionem in contextu et cursu semper aliquid priore maius insequitur, ut de vomitu in Antonium Cicero: "in coetu vero populi Romani, negotium publicum gerens magister equitum." singula incrementum habent. per se deforme vel non in coetu vomere, in coetu etiam, non populi, populi etiam, non Romani, vel si nullum negotium ageret vel si non publicum vel si non magister equitum. (9) sed alius divideret haec et circa singulos gradus moraretur: hic in sublime etiam cucurrit et ad summum non pervenit nisu, sed impetu.
>
> Augmentation is achieved more subtly and for that very reason perhaps more effectively, when without real breaks in a continuous passage something greater always follows what goes before. A good example is the passage of Cicero against Antony on the vomiting: "in coetu vero populi Romani negotium publicum gerens magister equitum." Each item adds to the seriousness of the charge. In itself vomiting is an ugly thing even if not in an assembly, or in an assembly but not of the people, or of the people but not of the Roman people; or if he was not engaged in business, or not public business, or not as *magister equitum*. (9) Another speaker would have divided these items and set them off by pauses; Cicero practically dashes to his climax and reaches the summit not by climbing but by momentum.

Our interest in this passage now is for the information it gives on the phrasing of the passage quoted from Cicero. Quintilian's language shows, I believe, that he recognized two *membra* in the quoted passage, the second beginning with "negotium." The words of the first unit are referred to by one set of particles (vel non . . . etiam non . . . etiam non). Then he uses a new set (vel si . . . vel si . . . vel si). Theoretically, one might expect the words "magister equitum" to form a separate unit. They are in fact set off by commas in all printed editions of Cicero that I have seen and in Quintilian 8. 4. 8 in some editions of Quintilian, though not when they are quoted in Quintilian 11. 3. 39. Attention to Cicero's language in the continuation of the sentence should settle the matter. He goes on: cui ructare turpe esset. These words if connected only with "magister equitum" would seem to imply some sort of social taboo on belching that applied to a person holding the office of *magister equitum*. But Cicero obviously refers to belching on the part of a major magistrate conducting public business as a breach of propriety. Stated in grammatical terms, the "cui" clause refers to the whole preceding unit, "negotium publicum gerens magister equitum," which constitutes a participial clause containing subject, verbal predicate, and direct object.

The words "cum citra distinctionem in contextu et cursu semper aliquid priore maius insequitur" call for comment on a number of points. First, the words "citra distinctionem" must be noticed. One's first impulse is to take "citra" as meaning simply "without" (see translations); but so far as I can see *citra* in Quintilian is never simply equivalent to sine.[12] For example, in 2. 4. 22 Quintilian says:

> Communes loci (de iis loquor quibus citra personas in ipsa vitia moris est perorare, ut in adulterum aleatorem petulantem) ex mediis sunt iudiciis et, si reum adicias, accusationes: quamquam hi quoque ab illo generali tractatu ad quasdam deduci species solent, ut si ponatur adulter caecus, aleator pauper, petulans senex.
>
> As for commonplaces (I mean those one uses against the vices themselves without specific characterization of the person involved, except as adulterer, gambler, or profligate) they come straight from the courts; if you add the name of the person, they are accusations. However, it is customary to particularize these generalities somewhat by calling the adulterer blind, the gambler poor, and the profligate old.

Here "citra personas" does not mean "without characterization" in the sense of without any at all; as Quintilian goes on to explain (quamquam etc.) he means rather "without going so far as actually to use specific characterizations." Both *sine* and *citra* occur in Quint. 12. 6. 4: plusque si

[12] See *TLL* s.v. citra and Quintilian, *Institutionis oratoriae liber xii*, edited by R. G. Austin, 73, Oxford, Clarendon Press, 1948, on Quint. 12. 2. 1.

separes usus sine doctrina quam citra usum doctrina valeat. It is possible to have practice without any instruction at all; but, if one has instruction, the alternative in regard to practice is to fall short rather than to be utterly without it. On the basis of these parallels, I should interpret "citra distinctionem" to mean: "without any really noticeable breaks in delivery," that is, with no breaks great enough to be called *distinctiones*, which term apparently includes here *subdistinctiones*. This interpretation fits the context. Quintilian says that a less skilfull speaker would have broken up the sequence of ideas by pronounced breaks (*cf.* divideret and moraretur) so as to seem to climb and struggle to his climax instead of reaching it with one smooth movement, as Cicero did.

The words "semper aliquid priore maius insequitur" have relevance to a topic that is rather frequently mentioned in discussions of word order in Latin. Quintilian's words will support the negative proposition that phrases in Cicero are not invariably constructed on a simple pattern that puts the most important and significant word first in the phrase. This seems to be indisputably clear; he says that each successive point made the charge more serious. On the other hand, Quintilian does not say that Cicero put the most emphatic word last either. The matter is not so simple as that. What Quintilian does say is that each of the two units he quotes from Cicero contains three points and that the successive points within each phrase add to the seriousness of the charge. Furthermore, in the words "citra distinctionem" he implies that each point was to be brought out clearly in delivery but without marked pauses or breaks between the various expressions. This is about as much as we can be sure of here, although comparison with some other passages to be studied later may permit us a further insight into Quintilian's point.

One should note that Quintilian omits two words entirely from his discussion: "vero" and "gerens." *Vero* is a postpositive enclitic connective. It is a verbal expression of sentence structure rather than a word of substantive meaning. The omission of it in the discussion seems reasonable. But one wonders why he says nothing about "gerens," and indeed seems to pay so little attention to the exact word used that he paraphrases it by "ageret." The most reasonable explanation seems to be that "gerens" too is not primarily a word of substantive meaning; it is simply a verbal form completing the grammatical construction. We must keep this passage in mind when we read elsewhere that the force of the language lies in the verbs (Quint. 9. 4. 26; *cf.* 1. 4. 18).

The positive information Quintilian gives about phrasing in the passage he quotes from Cicero may be represented visually as follows:

In coetu vero populi Romani | negotium publicum gerens magister equitum | cui etc.

In trying to discover the linguistic factors that determine the above phrasing, one notes first that all the words from "coetu" to "Romani" find their grammatical construction in the words that precede them, except for "vero" which is a postpositive enclitic sentence connective. Apparently words of this class follow special rules. The second unit begins with "negotium," which has no construction in the words which precede it, but all the other words in this phrase find a construction in the words that precede them. "Publicum" modifies "negotium"; "gerens" governs the accusative; and "magister equitum" is subject to the verb form "gerens." From the way in which the quotation is broken off, one also infers that "cui" begins a new phrasing unit. To say more about it might seem to be going beyond the evidence; but it does seem parallel to the "qui" in *Aen.* 1. 1.

2. QUINT. 9. 3. 23.

Illa quoque ex eodem genere possunt videri: unum quod interpositionem vel interclusionem dicimus, Graeci παρένθεσιν, παρέμπτωσιν vocant, cum continuationi sermonis medius aliqui sensus intervenit: "Ego cum te (mecum enim saepissime loquitur) patriae reddidissem" [Cic. *Mil.* 94].

Two other items can be regarded as belonging to this class. The first is what we call interpositio or interclusio; the Greek terms are parenthesis and paremptosis. It occurs when some other sentence comes in the middle of connected discourse.

Quintilian's meaning here is best illustrated by referring to Quint. 11. 3. 37 (discussed above, p. 489): tertio Italiam, quia interiectio est "fato profugus" et continuum sermonem, qui faciebat "Italiam Lavinaque" dividit. The phrasing of the sentence from the *pro Milone* can be represented as follows:

Ego cum te | mecum enim saepissime loquitur | patriae reddidissem |.

3. QUINT. 11. 3. 108–110.

Our third passage occurs in Quintilian's discussion of gesture.

Sunt quaedam latentes sermonis percussiones et quasi aliqui pedes, ad quos plurimorum gestus cadit, ut sit unus motus "novum crimen," alter "C. Caesar," tertius "et ante hanc diem," quartus "non auditum," deinde "propinquus meus," et "ad te," et "Q. Tubero," et "detulit." (109) unde id quoque fluit vitium ut iuvenes, cum scribunt, gestum praemodulati cogitatione sic componant, quo modo casura manus est. inde et illud vitium, ut gestus, qui in fine dexter esse debet, in sinistrum frequenter desinat. (110) melius illud, cum sint in sermone omni brevia quaedam membra, ad quae, si necesse sit, recipere spiritum liceat, ad haec gestum disponere: ut puta "novum crimen C. Caesar" habet per se finem quendam suum, quia sequitur coniunctio: deinde "et ante hanc diem non auditum" satis circumscriptum est.

There are certain subtle stresses in discourse, somewhat analogous to those of metrical feet, to which most people's gestures conform. For example, in the first sentence of the *pro Ligario*, they would have one gesture for each of the following: novum crimen, C. Caesar, et ante hanc diem, non auditum, propinquus meus, ad te, Q. Tubero, and detulit. (109) This results in one of two faults. Some young men, when writing, adjust what they are going to say to fit their gestures in advance; or, alternatively, a gesture that ought to end on the right frequently ends on the left. (110) It is much better, since there are in all connected discourse certain brief units between which one could draw breath if necessary, to accommodate one's gestures to them. For example, the unit "novum crimen C. Caesar" has a certain completeness of its own, because a conjunction follows. The next unit "et ante hanc diem non auditum" is sufficiently rounded off.

In this passage, Quintilian uses two different techniques for analyzing a piece of connected discourse into smaller units. Units of the first type mentioned here are smaller than the phrase, as we have been using the term. They seem to be purely grammatical in structure, in contrast to the units of the second type, which he defines in terms of formal oratorical techniques of delivery. If one were to try to apply this distinction generally, it might raise numerous problems; but Quintilian seems to give an excellent rule of thumb for recognizing the position of minor pauses or breaks in connected utterance in the words "ad quae si necesse sit recipere spiritum liceat." It is not necessary that the speaker actually pause or take breath at these points; they are potential breathing points. Those points themselves constitute what might be called phrase boundaries; they are marked by some sort of phonetic factor; and, according to Quintilian, they are universally found in connected discourse.

In analyzing the phrasing of the sentence from Cicero, we can be sure of Quintilian's phrasing of the first two units; and, from what he says, I should infer that the remainder of the sentence also constituted one unit. The phrasing of the whole sentence can be represented visually as follows in terms of the symbols we have adopted:

Novum crimen C. Caesar | et ante hanc diem non auditum | propinquus meus ad te Q. Tubero detulit ||.

First, we should notice the way in which Quintilian breaks this sentence into units or word groups which are smaller than phrases; for it is just as important to recognize what is not a phrase as it is to identify the phrases themselves. Indeed, these are but the two halves of the same problem. One notices that Quintilian treats the vocative "C. Caesar" as a kind of unit, although he clearly implies that a noticeable pause or break before it would be out of the question. The grouping "non auditum" may prove of some value for the study of other word groupings with "non." One should also note the grammatical structure of the rest of the sentence. It begins with a nominative, followed by a prepositional unit with a personal pronoun (ad te), another nominative, and then the verb. If one is justified in regarding the words "ad te" as a normal pronominal enclitic unit, there is no grammatical reason for a break in the whole word group, since, with the exception of the words "ad te," each expression after the first is grammatically prepared for by what precedes. There is a possible question about the relation of the two nominative word groups, "propinquus meus" and "Q. Tubero." One of these is in apposition to the other grammatically; at least that is the conventional terminology. All studies of grammatical apposition of this type in Latin that I have seen appear to decide which expression is in apposition with which on the basis of an actual or implicit translation into the vernacular of the person studying it. The problem deserves further investigation.[13] Accepting for the moment the normal concept of apposition, I should suggest that "propinquus meus" is in apposition with "Q. Tubero."

The suggestion in the words "satis circumscriptum est" should not be overlooked. So far, we have been concentrating mostly on beginnings of new word groups or phrases as the most reliable

[13] Sjögren, H., Zur Wortstellung *tua Bromia ancilla* und Verw., *Glotta* **10**: 23–29, 1919.

mark of the end of the preceding phrase. But Quintilian seems to imply in these words that the ends of phrases or word groups are also marked internally by effective linguistic signals. Another passage in Quintilian seems also to bear on this point (Quint. 9. 4. 29–32):

saepe tamen est vehemens aliquis sensus in verbo, quod si in media parte sententiae latet, transire intentionem et obscurari circumiacentibus solet, in clausula positum adsignatur auditori et infigitur, quale illud est Ciceronis: "ut tibi necesse esset in conspectu populi Romani vomere ⟨postridie⟩" [*add. Regius:* Cic. *2 Phil.* 63]. (30) transfer hoc ultimum: minus valebit. nam totius ductus hic est quasi mucro, ut per se foeda vomendi necessitas iam nihil ultra expectantibus hanc quoque adiceret deformitatem, ut cibus teneri non posset postridie. (31) solebat Afer Domitius traicere in clausulas verba tantum asperandae compositionis gratia et maxime in prooemiis, ut pro Cloatilla: "gratias agam continuo," et pro Laelia: "eis utrisque apud te iudicem periclitatur Laelia." adeo refugit teneram delicatamque modulandi voluptatem, ut currentibus per se numeris quod eos inhiberet obiceret. (32) amphiboliam quoque fieri vitiosa locatione verborum nemo est qui nesciat. haec arbitror, ut in brevi, de ordine fuisse dicenda: qui si vitiosus est, licet et vincta sit et apte [vincat ac apte AG] cadens oratio, tamen merito incomposita dicatur.

Often effective point depends upon a particular word. If such a word lies hidden in the middle of a sentence, it would escape notice and be obscured by its surroundings, but placed at the end it is marked and fastened into the listener's attention. A good example is the passage of Cicero: "ut tibi necesse esset in conspectu populi Romani vomere postridie." (30) Put the last word anywhere else and it will be less effective, for it is the real dagger in the whole passage. The fact of vomiting is bad enough, but when the listener is expecting nothing more the further disgrace is added that Antony could not keep his food down on the following day. (31) Domitius Afer used to put words at the end of phrases solely to roughen his composition especially in introductory passages, for example, in the *pro Cloatilla:* "gratias agam continuo," and in the *pro Laelia:* "eis utrisque apud te iudicem periclitatur Laelia." He was so anxious to avoid the soft and delicate pleasure of smoothness that he would break up a sentence that was naturally rhythmical. (32) Furthermore, everyone knows that faulty placing of words results in ambiguities. This, in brief, is what should be said about order. If order is faulty, the style is properly called disordered, even if it is otherwise coherent and rhythmical.

In his treatment of the passage from the second *Philippic,* Quintilian makes a number of points and each should be noted carefully. They are: (1) "postridie" is an important word (vehemens aliquis sensus in verbo); (2) it could, and under other rhetorical conditions probably would come somewhere in the middle of the sentence, but here it comes at the end; (3) the construction of the sentence is complete with "vomere" (iam nihil ultra expectantibus), and when, under the given rhetorical conditions, the grammatical construction of a unit is complete the listener does not expect anything to be added; (4) under these conditions, the word "postridie" seems to the listener to express an additional and an important point. There are a number of sentences in Latin which it is customary to cite as containing examples of an important or rhetorically emphatic word at the end. It will be interesting to see whether this sentence provides a parallel for some of them.

It is difficult to make much of the passages cited from Domitius Afer, since we lack any knowledge of their contexts. Apparently final position of the adverb in "gratias agam continuo" and that of "Laelia" in the other sentence seemed affected to Quintilian; but it is difficult if not impossible for us to make rational judgments about Latin word order without contexts.

The third point Quintilian makes is, however, clear and important. One of the commonest results of unskilfull order is ambiguity. This reminds one of the same problem in English and some of the traditional illustrations, e.g., "lost umbrella by man with gold head." In Latin, the possibilities of confusion and hilarious ineptness seem to be at least as great as those in English. From a practical point of view, one of the chief functions of skilfull word order in Latin is to keep together in one word group or phrase those expressions that belong together and to separate them effectively from contiguous phrases. This is perhaps the single most important principle of Latin word order, and it explains why Quintilian demands an adequate rhetorical reason for any addition to a phrase when the listener feels the construction is complete (iam nihil ultra expectantibus).

By way of summary, we may say that Quint. 11. 3. 108–110 gives us one example of phrasing structure and two important principles. First, there are short units in discourse marked by the fact that they end at potential breathing points; and, second, units marked in this way can or may exhibit a sort of internal completeness (satis circumscriptum est). Quint. 9. 4. 29–32 confirms the second of these principles and contains ex-

amples of departures from it; one Quintilian approves of and two he does not. The basis of Quintilian's dislike may be connected with a dislike which Cicero and Quintilian frequently express for certain types of dangling word order.

4. Quint. 9. 4. 67–71.

The next passage to be considered occurs in Quintilian's discussion of rhythm.

nam ut initia clausulaeque plurimum momenti habent, quotiens incipit sensus aut desinit, sic in mediis quoque sunt quidam conatus iique leviter insistunt. currentium pes, etiam si non moratur, tamen vestigium facit. itaque non modo membra atque incisa bene incipere atque cludi decet, sed etiam in iis, quae non dubie contexta sunt nec respiratione utuntur, illi velut occulti gradus sint [vel occulti gradus *codd.*]. (68) quis enim dubitet, unum sensum in hoc et unum spiritum esse? "Animadverti, iudices, omnem accusatoris orationem in duas divisam esse partes": tamen et duo prima verba et tria proxima et deinceps duo rursus ac tria suos quasi numeros habent ⟨et⟩ spiritum sustinemus, sicut apud rhythmicos aestimantur [sic apud rithmis (aput rimas A) aestimantur AG]. (69) hae particulae prout sunt graves, acres, lentae, celeres, remissae, exultantes, proinde id, quod ex illis conficitur, aut severum aut luxuriosum aut quadratum aut solutum erit. (70) quaedam etiam clausulae sunt claudae atque pendentes, si relinquantur, sed sequentibus suscipi ac sustineri solent, eoque facto vitium, quod erat in fine, continuatione emendatur [continuatione mendat G continuatio **mendat A]. "non vult populus Romanus obsoletis criminibus accusari Verrem" durum, si desinas: sed cum est continuatum iis quae sequuntur, quamquam natura ipsa divisa sunt "nova postulat, inaudita desiderat," salvus est cursus. (71) "ut adeas, tantum dabis" male cluderet, nam et trimetri versus pars ultima est: excipit "ut cibum vestitumque intro ferre liceat, tantum": praeceps adhuc firmatur ac sustinetur ultimo "nemo recusabat."

Although the first and last parts, where the sentences begin and end, are of the greatest importance in rhythm, in between there are also some special things one tries to do which require slight pauses. Though the foot of the runner does not stay, it does leave footprints. Consequently, it is not enough that *cola* and *commata* begin and end nicely; even in those sentences which are quite unified and which lack any place for drawing breath, there still are so to speak hidden steps (Butler translates: there must be such almost imperceptible pauses). (68) The following is undoubtedly a single sense unit and delivered in a single breath: "Animadverti iudices omnem accusatoris orationem in duas divisam esse partes." Yet it is broken into four parts consisting of two, three, two, and three words respectively. Each of these parts has its own rhythmical structure, and between them we sustain the breath, to use the term of the *rhythmici*. (69) These small units may be grave or vigorous, slow or fast, subdued or lively; just so the period they comprise will be austere or lush, compact or loose. (70) There are also clausulae that would seem to limp or hang, if unsupported; but they are usually picked up and supported by what follows. By this device, the fault one would have had if the clausulae were truly final is corrected as the voice continues. In the following example, "non vult populus Romanus obsoletis criminibus accusari Verrem," the rhythm would be harsh, if one stopped here; but the delivery has to carry right over to the following sentence: "nova postulat, inaudita desiderat," despite the fact that the second sentence is entirely separate in both form and meaning. (71) To take another example, "ut adeas tantum dabis" ends badly, since it actually forms the latter part of a trimeter; it is picked right up with "ut cibum vestitumque intro ferre liceat, tantum." This ending is still too abrupt, but it is strengthened and supported by the concluding phrase "nemo recusabat."

The first part of this passage is of considerable importance for our purpose, since it deals with those almost imperceptible breaks and shifts of tone that occur in continuous utterance. There is not much specific and usable information on this subject in ancient authors, so that we shall have to make the most of what we have. According to Quintilian, Cicero's sentence goes as follows:

Animadverti iudices | omnem accusatoris orationem | in duas | divisam esse partes ||.

Quintilian's grouping of words in the sentence from Cicero is fortunately quite clear, so that we can feel confident of the facts and proceed to analyze the sentence for the linguistic features associated both with the position of the breaks and with the internal continuity of the phrases.

The first unit is "animadverti iudices." Quintilian cites these two words alone a number of times and in such a way as to confirm the fact that he took them as a single unified phrase. The word "iudices" here is an excellent example of what might be called the initially postpositive enclitic vocative. The second phrase is "omnem accusatoris orationem." It opens with an adjective in the accusative modifying the subject of an infinitive clause. It has no direct grammatical relation with the words that precede it. This raises a question: if "orationem" were the first word of this group, would the phrasing be the same? We can only hope at this point that other

evidence will help to resolve this question and others of a related sort. In considering the internal structure of the phrase "omnem accusatoris orationem," one notes first the obvious agreement of "omnem" and "orationem," which is probably the chief linguistic factor in holding the phrase together. Strictly speaking, however, the word "accusatoris" has no direct grammatical relation or construction with the words that precede it; and yet it is certainly to be pronounced as a continuing element in the phrase, without a break of any kind comparable to those Quintilian remarks upon. Later we shall try to particularize the precise linguistic principles that underlie this technique of phrasing, by means of a study of other phrases that are more or less parallel.

The phrasing of the second half of the sentence is interesting for a number of reasons. The breaks before "in duas" and "divisam" can both be explained simply on the basis of the principle already mentioned frequently. "In duas" has no direct grammatical relation either with what immediately precedes or with what immediately follows. In those respects, it is comparable to "Italiam" in *Aen.* 1. 2. The fact that the group "divisam esse partes" is to be delivered as a unit also seems quite significant. Grammatically "partes" is not constructed directly with "divisam esse," but it finds its grammatical function through the preposition "in." The words "in duas . . . partes" are consequently an example of what is known as hyperbaton, and they are so cited by Quintilian (8. 6. 65):

> At cum decoris gratia traicitur [trahitur AG] longius verbum, proprie hyperbati tenet nomen: "animadverti, iudices, omnem accusatoris orationem in duas divisam esse partes." nam "in duas partes divisam esse" rectum erat, sed durum et incomptum.

> When the displacement of a word goes beyond mere anastrophe and is employed for the sake of elegance, it is properly called hyperbaton. For example, "animadverti. . . ." The normal order would be "in duas partes divisam esse"; but that order is harsh and unpolished.

This example from Cicero serves to illustrate some of the difficulties involved in the use of the term hyperbaton as a tool of grammatical or literary analysis. According to Quintilian, the order that is "rectum" is "in duas partes divisam esse." From this statement one might infer that "partes" is the word which is out of its natural position and the one in which the effect of hyperbaton should be sought. But we read elsewhere (Quint. 9. 4. 26) that every sentence in which a verb is not in final position is an instance of hyperbaton; so we must apparently recognize the existence of two hyperbata here. Analysis in terms of hyperbaton would be a useful tool on two conditions: first, one must be able to ascertain which expression is out of its natural position, and, second, one must be able to say that for that reason some particular stylistic or rhetorical significance attaches to it. Perhaps the first of these conditions might be met in some practical manner or other, but I do not see how the second can be met here. Certainly, it would be difficult to maintain that special rhetorical or stylistic significance attaches to the word "partes" in this context. As we listen to the latter part of this sentence, Cicero's meaning is so obvious by the time we get to the last word that we would not even need to hear the word "partes" itself to get his meaning. Suppose someone near us coughed at this point and we missed the word altogether, nothing essential would be lost. But, if we missed, let us say, "duas," we could not know whether it was "duas" or "tres" or some other number. The truth seems to be that the term hyperbaton belongs properly to the technique of analyzing discourse from the point of view of the writer or speaker composing a work, rather than from that of a person listening to or reading the finished product. It is from the point of view of the writer that Quintilian discusses the figure in 8. 6. 62–67 and in 9. 4. 26. The word "hyperbaton" is a useful one for the teacher working over a student's composition. It is a convenient and compendious way of suggesting that the student try out some other arrangement of words. But for a person interpreting a text there is no other arrangement of words than the one before him adopted by his author. The technical terms and techniques of rhetoric are not always the most useful to the grammarian, but the facts with which rhetoric deals are of great importance. We must try to get at those facts.

In this connection, it is instructive to compare Cicero's order of words with the alternative suggested by Quintilian:

(*a*) in duas divisam esse partes,
(*b*) in duas partes divisam esse.

In the first form, this group of words is broken into two phrases by a phrase boundary before "divisam." In the second form, there appears to be no reason for phrasing the words except in one group, since there is no place for a phrase

boundary within the group. From the point of view of delivery, then, the two groups are not equivalent. But the words are the same, the meaning is the same. The difference between the two forms must lie, then, precisely in the phrasing and its effect. To determine and define what that effect is may be a most troublesome problem, but at least we know what we are looking for. And I believe we can assert again with confidence on the basis of this comparison that there is a real and significant correlation between word order patterns and phrasing in Latin. Furthermore, I suggest that the significance of word order patterns in Latin is not to be sought in some mechanical distinction between normal and abnormal. Such a distinction usually equates "abnormal" with "significant," and leaves us with the dangerous corollary that being normal implies a lack of significance. The correlation between word order and phrasing suggests that it is in terms of phrasing that we will discover the significance of word order patterns. That is to say, if we can discover and define the principles of phrasing in Latin, and if we can determine the correlations between phrasing and the normal techniques of Latin utterance, we shall then be in a position to appreciate patterns of word order and their significance.

The second part of the passage from Quintilian can be treated briefly. It provides a number of examples of phrasing, although none adds much to our information, since all the breaks that are clearly indicated occur at the ends of clauses or sentences. I include it here primarily for the sake of completeness, and also because of Quintilian's excellent discussion of the way the voice must be managed to give Cicero's sentences effective expression.

5. Cicero, *Orator* 213–215.

The next two passages to be considered occur in Cicero's discussion of rhythm in the *Orator*. The first is as follows:

Me stante C. Carbo C. f. tr. pl. in contione dixit his verbis: "O M. Druse, patrem appello"—haec quidem duo binis pedibus incisim; dein membratim: "tu dicere solebas sacram esse rem publicam"—haec autem [autem *Piderit* item L] membra ternis: (214) post ambitus: "quicumque eam violavissent, ab omnibus esse ei poenas persolutas"—dichoreus; nihil enim ad rem, extrema illa longa sit an brevis; deinde: "patris dictum sapiens temeritas fili comprobavit"—hoc dichoreo tantus clamor contionis excitatus est, ut admirabile esset. quaero nonne id numerus effecerit. verborum ordinem immuta, fac sic: "comprobavit fili temeritas": iam nihil erit, etsi temeritas ex tribus brevibus et longa est, quem Aristoteles ut optimum probat, a quo dissentio. (215) "At eadem verba, eadem sententia." Animo istuc satis est, auribus non satis.

I was standing in an assembly when the tribune of the people, Gaius Carbo the younger, spoke in these words: "O Marce Druse, patrem appello"—here two *commata*, each consisting of two feet; then in *cola*: "tu dicere solebas sacram esse rem publicam"; this has *cola* of three feet each; (214) then followed the period: "quicumque eam violavissent ab omnibus esse ei poenas persolutas": this ends in a ditrochee, for the quantity of the final syllable makes no difference; then: "patris dictum sapiens temeritas fili comprobavit"; it was marvellous what a shout arose from the crowd at this ditrochee. Was it not, I ask, the rhythm which produced this? Change the order of the words and write it this way: "comprobavit fili temeritas." The effect is now gone, although *temeritas* consists of three shorts and a long, the foot which Aristotle regards as the best; but I disagree. (215) "The words, however, are the same, the thought is the same." That satisfies the mind, but not the ear. (Transl. Hubbell.)

Before analyzing the phrasing of the passages quoted by Cicero, it may be helpful to remind ourselves of Cicero's use of the terms *incisum, membrum, ambitus,* their derivatives and synonyms. An *incisum* is a short phrasing unit usually consisting of not more than two or three words and not intended to stand alone as independent. A *membrum* is usually distinguished from an *incisum* as longer. It may be relatively independent, or two or more *membra* may form a period (*ambitus*).

The first four units Cicero quotes are phrased as follows:

O M. Druse | patrem appello | tu dicere solebas | sacram esse rem publicam |.

The principal points to be noted here seem to be the following. First, the initial vocative with *o* stands as a separate unit; the phrase "patrem appello" is epexegetic and parenthetical; it is a separate clause. In the continuation of the sentence, the pronoun "tu" seems to give an adequate start to the unit that follows the parenthesis. The break before "sacram" is interesting, and could be explained in a number of ways. We may note first simply that "sacram" has no direct grammatical relation with what precedes; it is the first word of an infinitive clause in *oratio obliqua*, and it is a predicate adjective. Which of these factors is the most significant for the phrase boundary

before "sacram," or whether it is to be accounted for on the basis of some other factor is a question to which we shall have to return when we have collected all the examples of phrasing we can. Cicero says that the sentence beginning with "quicumque" is a period. The minimum requirement for a period is two *membra*, and it seems a proper inference that the division between them coincides with that between the two clauses. The indicated phrasing, then, is:

Quicumque eam violavissent | ab omnibus esse ei poenas persolutas ||.

Cicero's language seems clearly to indicate that there was no phrasing break in the following sentence: patris dictum sapiens temeritas fili comprobavit. For each of the preceding sentences, Cicero indicates a division into *incisa* or *membra*, and one feels fairly confident in inferring the absence of any division in this sentence. The matter is of some importance and one could wish for more specific evidence, but we have to make the best of what we have. The question, of course, is whether Latin delivery would make a break before "temeritas," or, to put the matter in more general terms: Is the subject of a clause normally marked by a phrasing break before it? I suspect that our unconscious linguistic habits taken over from the modern European languages lead us to expect such a break and the Golden Rule of Construing bids us seek out the subject as one of the first steps in attacking a Latin sentence. My own personal view is that Cicero's treatment of this sentence is good evidence that the nominative subject in Latin is not marked by any phrasing break simply because it is the subject, although of course the nominative may stand as the initial element in a phrase. However, the most one can conclude from Cicero's discussion of this sentence is that the phrasing I suggest is possible and indeed likely. We can adopt this phrasing provisionally, although we shall have to seek other evidence by which to test it.

6. CICERO, *Orator* 222–226.

Sin membratim volumus dicere, insistimus atque, cum opus est, ab isto cursu invidioso facile nos et saepe diiungimus. sed nihil tam debet esse numerosum quam hoc, quod minime apparet et valet plurimum. ex hoc genere illud est Crassi: "missos faciant patronos; ipsi prodeant"—nisi intervallo dixisset "ipsi prodeant," sensisset profecto se fudisse senarium; omnino melius caderet "prodeant ipsi"; sed de genere nunc disputo. (223) "cur clandestinis consiliis nos oppugnant? cur de perfugis nostris copias comparant contra nos?" prima sunt illa duo, quae κόμματα Graeci vocant, nos incisa dicimus; deinde tertium—κῶλον illi, nos membrum—sequitur non longa—ex duobus enim versibus, id est membris, perfecta est—comprehensio et in spondeos cadit; et Crassus quidem sic plerumque dicebat idque ipse genus dicendi maxime probo. sed quae incisim aut membratim efferuntur, ea vel aptissime cadere debent, ut est apud me: "domus tibi deerat? at habebas. pecunia superabat? at egebas." Haec incise dicta sunt quattuor; (224) at membratim quae secuntur duo: "incurristi amens in columnas, in alienos insanus insanisti." deinde omnia tanquam crepidine quadam comprehensione longiore sustinetur: "depressam, caecam, iacentem domum pluris quam te et quam fortunas tuas aestimasti"—dichoreo finitur. at spondeis proximum illud. nam in his, quibus ut pugiunculis uti oportet, brevitas facit ipsa liberiores pedes; saepe enim singulis utendum est, plerumque binis et utrisque addi pedis pars potest, non fere ternis amplius. (225) incisim autem et membratim tractata oratio in veris causis plurimum valet, maximeque eis locis, cum aut arguas aut refellas, ut nos in Corneliana secunda: "o callidos homines, o rem excogitatam, o ingenia metuenda!"—membratim adhuc; deinde caesim: "diximus," rursus membratim: "testis dare volumus"—extrema sequitur comprehensio, sed ex duobus membris, qua non potest esse brevior: "quem, quaeso, nostrum fefellit ita vos esse facturos?" (226) nec ullum genus est dicendi aut melius aut fortius quam binis aut ternis ferire verbis, nonnunquam singulis, paulo alias pluribus, inter quae variis clausulis interponit se raro numerosa comprehensio.

But if we wish to speak in *membra*, we stop, and when necessary, easily and often turn off from a course which offends. However, it is in the nature of things that nothing is rhythmical to such a degree as this, which shows least and has the greatest effect. An example of this style may be cited from Crassus: "Missos faciant patronos, ipsi prodeant"; If he had not paused after "patronos," he would have recognized that he had made a senarius: on the whole "prodeant ipsi" would give a better cadence, but I am speaking of general principles now—(223) "cur clandestinis consiliis nos oppugnant? Cur de perfugis nostris copias comparant contra nos?" The first two are what the Greeks call *commata*, we call *incisa;* the third they call *colon*, we *membrum;* the last is a full period, not long—it consists of only two verses, that is *membra*—with spondaic cadence. Crassus generally spoke in this style, and that is the style which I myself chiefly favour. But if *incisa* and *membra* are used, they ought to have a proper cadence, for example, my own words: "Domus tibi deerat? at habebas. Pecunia superabat? at egebas." Here are four *incisa;* (224) the following falls into two *membra:* "Incurristi amens in columnas, in alienos insanus insanisti." Then the whole passage

is set, as it were on the foundation of a longer period: "Depressam, caecam, iacentem domum pluris quam te et quam fortunas tuas aestimasti." It ends in a ditrochee. But the previous sentence ended in spondees. For in these phrases which should be used as little daggers, the very brevity causes the feet to be somewhat freer; often you must use one, more frequently two—to both of these part of a foot can be added—hardly more than three. (225) A speech formed of *incisa* and *membra* is very efficient in actual practice, particularly in passages of demonstration or refutation, as in our second speech for Cornelius: "O callidos homines, o rem excogitatam, o ingenia metuenda!" So far it is in *membra;* then with an *incisum:* "Diximus"; then again a *membrum:* "Testis dare volumus." Last comes the period, composed of two *membra,* the shortest possible form: "Quem, quaeso, nostrum fefellit ita vos esse facturos?" (226) There is no style better or stronger than to strike with phrases of two or three words, sometimes with single words, and at other times with several, in the midst of which comes sparingly the rhythmical period with varying cadences. (Transl. Hubbell.)

This passage contains a large number of examples of phrasing. I transcribe them below with the indicated phrasing, and number them for convenience of discussion.

1. missos faciant patronos | ipsi prodeant ||.
2. cur clandestinis consiliis nos oppugnant? |
3. cur de perfugis nostris | copias comparant contra nos? ||
4. domus tibi deerat? | at habebas | pecunia superabat? | at egebas |.
5. incurristi amens in columnas | in alienos insanus insanisti ||.
6. depressam caecam iacentem domum | pluris quam te et quam fortunas tuas aestimasti ||.
7. o callidos homines | o rem excogitatam | o ingenia metuenda ||
8. diximus | testis dare volumus ||
9. quem quaeso nostrum fefellit | ita vos esse facturos ||.

No. 1 scarcely calls for comment; one expects independent clauses to be pronounced separately. In the alternative "prodeant ipsi" as against "ipsi prodeant" we have another example of a variation in word order, where the difference is specifically stated to lie in the way the two versions sound.

No. 2 is called a *membrum* and consequently has no internal phrasing breaks or phrase boundaries. The interrogative "cur" is spoken in the same pronunciation group as the word which follows; in fact "clandestinis" seems to be the word to which the question "cur" primarily refers. The adjective, which seems to be attributive in force, goes closely with its noun. The pronoun "nos" seems to be the usual enclitic pronoun, and the verb "oppugnant" has been prepared for in one way or another by each of the preceding expressions. It fulfills and completes all the grammatical expectations that have been aroused in the preceding words.

Cicero says that no. 3 is a period consisting of two *membra.* He does not say where the break comes, but the only possible division seems to be before "copias," and I have so marked it. As in the preceding sentence, "cur" is to be pronounced closely with what follows, and "de perfugis nostris" is surely to be spoken as a unit. The words "copias comparant contra nos" also seem to form a unit. It would be a question whether "copias comparant" (i.e., without "contra nos") would make a similar unit; but perhaps it is wiser not to ask such questions now, since one must go beyond the evidence before us in search of an answer. I raise the point because I wish to note that, though "copias" does not go directly with the words that immediately precede it, this fact may not be the only factor involved in dividing the sentence into *membra* at this point.

The phrases in no. 4, which Cicero calls *incisa,* exhibit the essential features of what grammarians call parataxis. Grammatically, each unit is a separate clause; but the fact that they are not independent clauses in the usual sense is expressed in great part by the technique of delivery.

In no. 5, the break seems obvious and does not call for comment; but the fact that the nominative adjectives do not involve a phrasing break before them is worth noting.

Cicero's description of no. 6 as a *comprehensio* implies that it consists of *membra.* The accusatives at the beginning form a unit as do the words "pluris . . . aestimasti." The suggestion that the break between the two *membra* occurs before "pluris" seems justified by the fact that that word begins a new grammatical series.

In no. 7, the series of exclamatory accusatives with "o" seems to form a natural grouping of *incisa.* This passage and a number of others seem to indicate that the interjection "o" regularly serves as a linguistic mark of a new phrasing unit.

Since Cicero says that in no. 8 "diximus" is an *incisum,* it does not stand alone as a separate unit. Indeed, if pronounced as a completely separate unit with falling final cadence, it would mean that the speech was really completed. It must consequently have been spoken in such a way as to indicate that more was to follow The pause after

"volumus" might be either that indicated by | or by ||.

Cicero says that no. 9 also consists of two *membra*. Again we must infer the proper place for the break, but before "ita" seems the only possible place. The sentence spoken thus is parallel to a passage already studied (tu dicere solebas | sacram esse rem publicam), in that the infinitive clause stands as a separate phrasing unit. In both instances, the infinitive clause is introduced by an expression that looks ahead grammatically but has no construction in what precedes it. One may also note the initially postpositive enclitic "quaeso."

7. *Ad Herennium* 4. 26.

Membrum orationis appellatur res breviter absoluta sine totius sententiae demonstratione, quae denuo alio membro orationis excipitur, hoc pacto: "et inimico proderas." id est unum quod appellamus membrum; deinde hoc excipiatur oportet altero: "et amicum laedebas." ex duobus membris haec exornatio potest constare, sed commodissima et absolutissima est quae ex tribus constat, hoc pacto: "et inimico proderas et amicum laedebas et tibi non consulebas." item: "nec rei publicae consuluisti nec amicis profuisti nec inimicis restitisti."

Articulus dicitur cum singula verba intervallis distinguuntur caesa oratione, hoc modo: "acrimonia, voce, vultu adversarios perterruisti." item: "inimicos invidia, iniuriis, potentia, perfidia sustulisti." inter huius generis et illius superioris vehementiam hoc interest: illud tardius et rarius venit, hoc crebrius et celerius pervenit. itaque in illo genere ex remotione bracchii et contortione dexterae gladius ad corpus adferri, in hoc autem crebro et celeri corpus vulnere consauciari videtur.

Colon or Clause is the name given to a sentence member, brief and complete, which does not express the entire thought, but is in turn supplemented by another colon, as follows: "on the one hand you were helping your enemy." That is one so-called colon; it ought then to be supplemented by a second; "and on the other you were hurting your friend." This figure can consist of two cola, but it is neatest and most complete when composed of three as follows: "You were helping your enemy, you were hurting your friend, and you were not consulting your own best interests." Again: "You have not consulted the welfare of the republic, nor have you helped your friends, nor have you resisted your enemies." It is called a Comma or Phrase when single words are set apart by pauses in staccato speech, as follows: "By your vigour, voice, looks you have terrified your adversaries." Again, "You have destroyed your enemies by jealousy, injuries, influence, perfidy." There is this difference in onset between the last figure and the one preceding: the former moves upon its object more slowly and less often, the latter strikes more quickly and frequently. Accordingly in the first figure it seems that the arm draws back and the hand whirls about to bring the sword to the adversary's body, while in the second his body is as it were pierced with quick and repeated thrusts. (Transl. Caplan.)

The phrasing of the first two examples quoted is quite simple; each spoken unit consists of a separate syntactical unit and the separate phrases are marked by conjunctions, as follows:

Et inimico proderas | et amicum laedebas | et tibi non consulebas ||. Nec rei publicae consuluisti | nec amicis profuisti | nec inimicis restitisti ||.

The word *membrum* here seems to correspond fairly well to Cicero's use of the term; but *articulus*, as Caplan suggests, does not quite correspond to *incisum* in Cicero's usage. According to the author of the *Ad Herennium*, *articulus* is more restricted in meaning than *incisum*, since he says that the *articulus* consists of a single word. The phrasing of his two examples is not completely clear. It is obvious that his delivery calls for a phonetic factor of some sort separating the ablatives in series. But he does not give us enough information to enable us to define the factor more accurately. I see no way to determine whether he would have made a break before "adversarios" in the first example, or after "inimicos" in the second.

The following sections of the *Ad Herennium* discuss the period (continuatio), isocolon, homoeoptoton, homoeoteleuton, and certain other verbal figures from which one might draw a number of examples of phrasing, but I am not going to transcribe the passages or discuss them now, since all the examples seem to offer is a number of separate clauses. I shall also merely refer to the treatment of asyndeton (dissolutum) in 4. 41.

IV. CONCLUSIONS

We are now in a position to state the most important conclusions to be drawn from the evidence reviewed in the preceding chapter. The first conclusion is that the phonetic factors Quintilian describes in his discussion of *Aen.* 1. 1–3 actually occur as a regular feature of Latin speech. In fact, Quintilian also says (11. 3. 110, see p. 494): cum sint in sermone omni brevia quaedam membra ad quae, si necesse sit, recipere spiritum liceat. These *membra* that Quintilian mentions I call phrases, although I also extend that term

to include other comparable units, where the break between units would not ordinarily serve for taking a new breath; in this also I follow Quintilian (11. 3. 39, see p. 490). His description of *membra* which we have just quoted is more a rule of thumb than a strict definition. In fact, he says himself that a speaker may take a breath at other points than between phrases, but that in that case one must be especially careful not to give the impression of a break in phrasing by the manner in which he does so.

Our first fact, then, is that there are phrases in Latin and that the unity and coherence of the phrase are indicated in speech by certain techniques of utterance. Those techniques I call phrasing. We also need a term for the thing that separates one phrase from the next. In order to have a quite neutral term for this factor, I have adopted the term "phrase boundary." To make the most practical use of the passages in classical authors relating to phrasing, we need a sort of glossary of terms. I offer such a glossary here.

Phrase: continuus sermo, membrum, incisum, particula, comma, colon, articulus.

Collection of two or more phrases: periodus, circumductio, ambitus, comprehensio (Quint. 9. 4. 124), isocolon, homoeoptoton, homoeoteleuton, dissolutum (asyndeton).

Phrasing: ut sit oratio distincta, et incipiat ubi oportet et desinat, agere, actio, pronuntiatio.

Unity within the phrase itself: continuus sermo, continuatio, continuare.

Phrase boundaries and techniques for indicating them: quo loco sustinendus et quasi suspendendus sermo sit . . . quo deponendus, hypodiastole, hypostigme, suspendere, dividere, insistere, distinguere (and cognates), deponere, morari, mora, novum rursus exordium faciam, intervallum, intercapedo, clausula, initium, quotiens incipit sensus aut desinat.

This variety of terminology for phrase boundaries and the phonetic technique for indicating them reflects in part the great variety in the character of the phrase boundaries themselves. Approaching them from a positive point of view, one might have considerable difficulty in finding a common element that could be described simply as characteristic of them all. But negatively all phrase boundaries are distinguished from what Quintilian calls *continuus sermo* or *continuatio*. These terms apply to the internal coherence of the phrase itself, and the structure of Latin phrasing can be described in terms of the two contrasting elements of the phrasing break or phrase boundary and that of continuity or the internal coherence of the phrase.

Breaks in phrasing occur at points where a word does not go closely in syntax with what immediately precedes. One has continuity when a word does go closely in syntax with what immediately precedes it. Both these propositions are amply illustrated in the material we have been studying. But these propositions do not cover all the problems that may arise, because they are not convertible, or at least not necessarily so. As a matter of fact, breaks of some sort may occur even within syntactically coherent word groups, and under some conditions one can have phrase continuity even without such coherence between immediately contiguous words. If these exceptions to our general statements are arbitrary and cannot be reduced to rule, we may well despair of understanding phrasing in Latin; but if we can discover and formulate the conditions under which these factors also operate, we shall be able to recover one very essential feature of the Latin language that has been lost to us, and through it we may also gain a new command of Latin speech and of Latin literature itself.

We shall take up first the matter of breaks in delivery which are not specifically associated with phrasing. In his discussion of the metrics of clausulae, Quintilian says (9. 4. 107–108):

> sic melius quam choreo praecedente "quis non turpe duceret?" si ultima brevis pro longa sit: sed fingamus sic: "non turpe duceres." sed hic est illud inane quod dixi: paulum enim morae damus inter ultimum atque proximum verbum, et "turpe" illud intervallo quodam producimus: alioqui sit exultantissimum et trimetri finis "quis non turpe duceret?" sicut illud "ore excipere liceret" si iungas, lascivi carminis est. sed interpunctis quibusdam et tribus quasi initiis fit plenum auctoritatis.

This is better than if a double trochee precedes, as in "quis non turpe duceret" if one may take the last syllable as long, or for the sake of the illustration change "duceret" to "duceres." This example also illustrates the *inane* I spoke of above, since we put a brief pause between the last two words and lengthen the last syllable of "turpe" by a kind of pause or delay in utterance. Otherwise, it will be singsongy and like the end of a trimeter. Similarly, the words "ore excipere liceret," if pronounced together, will have a bawdy metre; but broken into units and with what amounts to three new starts the words are full of dignity.

The pause Quintilian remarks on between "turpe" and "duceret" seems to be designed solely

to change the rhythmical structure of the phrase. In this instance, the change in the technique of delivery seems to have no other rhetorical significance; at least Quintilian mentions none. But theoretically every change in technique of delivery modifies in some manner the tone and to a certain extent the meaning of what is expressed by the words. This principle is well illustrated by Quintilian's second example, "ore excipere liceret." He says that if one separates these words slightly and makes a new start with each one, the phrase becomes full of dignity and effectiveness. Cicero himself does not comment on his delivery of either of these phrases; indeed, both come from speeches which were not delivered by him. One rather suspects that Quintilian's comments may be in the nature of a *solutio*. The rhythm of these two clausulae was discovered and attacked by some analyst of Cicero's clausulae, and Quintilian's suggestions sound very much as though they were intended to save Cicero's credit. That point, however, is not important.

The points that are important for us are two. First, Quintilian distinctly implies that the light pause he desiderates between "turpe" and "duceret" is purely a matter of rhythm. This is made clear by the words "illud inane quod dixi," which refer to his discussion in 9. 4. 51:

> inania quoque tempora rhythmi facilius accipient, quamquam haec et in metris accidunt. maior tamen illic licentia est, ubi tempora etiam [animo] metiuntur et pedum et digitorum ictu, ⟨et⟩ intervalla signant quibusdam notis atque aestimant, quot breves illud spatium habeat.
>
> Prose rhythm more easily admits of *inania tempora*, although they also occur in verse. But there is more licence where the times are measured by the beat of feet or fingers and people use marks to show how many units of time measure there are.

Second, Quintilian says that the words "ore excipere liceret" are capable of two quite different possible rhetorical effects depending upon the technique of delivery, and furthermore that it would be legitimate and proper to break the phrase into three more or less separate units. His preferred delivery of these words is "tribus quasi initiis," or with three separate beginnings. These words suggest that initial elements in pronunciation units or phrases are somehow or sometimes important from the point of view of delivery. The pause between "turpe" and "duceret" is like a pause in the metrical sense and is without rhetorical significance. But the breaks in "ore excipere liceret" are described as involving something that resembles small *distinctiones* and "quasi initiis"; these words imply that rhetorical as well as purely metrical factors are involved. The breaks here seem in some ways similar to those referred to in Quint. 8. 4. 8 (see p. 492). Quintilian is, however, quite careful to distinguish the breaks he calls for in these two phrases of Cicero from *distinctiones*. In the grammatical terminology used by Augustine, they fall under *pronuntiatio* rather than under *distinctio*. These passages from Quintilian provide positive evidence for breaks in utterance that are not phrasing breaks, although the delivery Quintilian recommends for "ore excipere liceret" employs something that superficially resembles them. In connection with these two groups of words we should also note that Quintilian is prepared to discuss alternative modes of delivery and that many factors enter into his choice between alternatives. One can imagine similar discussion of alternatives in passages like those given above by the Auctor ad Herennium to illustrate *articulus* (see p. 501). Also, Cicero's words (see p. 500) "depressam caecam iacentem domum" could be spoken either with or without breaks between the modifiers of "domum."

We may conclude, then, that, when breaks in utterance occur within a coherent phrasing unit, they fall under the classification of *pronuntiatio* rather than of *distinctio*, and that they involve what is essentially a different set of phonetic factors from those associated with *distinctio*.

The second conclusion is that we possess the written record of a number of Latin utterances in which we can indicate with certainty the place where one or other of the phonetic factors involved in *distinctio* actually occurred in the speech of a specific and identifiable Latin speaker. We can even make a list of these utterances and indicate the position of one or other of the phonetic factors we have been discussing.

Such a list follows.

1. Arma virumque cano | Troiae qui primus ab oris | Italiam | fato profugus | Lavinaque venit litora ||. (Verg. *Aen.* 1. 1–3.)
2. | atque altae moenia Romae ||. (Verg. *Aen.* 1. 7.)
3. In coetu vero populi Romani | negotium publicum gerens magister equitum | cui etc. (Cic. *2 Phil.* 63.)
4. Ego cum te | mecum enim saepissime loquitur | patriae reddidissem |. (Cic. *Mil.* 94.)

5. Novum crimen C. Caesar | et ante hanc diem non auditum | propinquus meus ad te Q. Tubero detulit ||. (Cic. *Lig.* 1.)

6. | ut tibi necesse esset in conspectu populi Romani vomere postridie ||. (Cic. 2 *Phil.* 63.)

7. Animadverti iudices | omnem accusatoris orationem | in duas | divisam esse partes ||. (Cic. *Clu.* 1.)

8. O M. Druse | patrem appello | tu dicere solebas | sacram esse rem publicam | quicumque eam violavissent | ab omnibus esse ei poenas persolutas ||. patris dictum sapiens temeritas fili comprobavit ||. (Carbo apud Cic. *Orator* 213–214.)

9. Missos faciant patronos | ipsi prodeant ||. cur clandestinis consiliis nos oppugnant? | cur de perfugis nostris | copias comparant contra nos? || (Crassus apud Cic. *Orator* 222–223.)

10. Domus tibi deerat? | at habebas |. pecunia superabat? | at egebas |. incurristi amens in columnas | in alienos insanus insanisti ||. depressam caecam iacentem domum | pluris quam te et quam fortunas tuas aestimasti ||. (Cic. *Scaur.* fr. in *Orator* 223–224.)

11. O callidos homines! | o rem excogitatam! | o ingenia metuenda! || diximus | testis dare volumus ||. quem quaeso nostrum fefellit | ita von esse facturos? || (Cic. *Corn.* fr. in *Orator* 225.)

12. Et inimico proderas | et amicum laedebas | et tibi non consulebas ||. (*Ad Herennium* 4. 26). Nec rei publicae consuluisti | nec amicis profuisti | nec inimicis restitisti ||. (*Ibid.*)

In my opinion this list constitutes the major conclusion of our study, since it gives us a set of paradigmatic sentences which can now be used to guide us in making a similar analysis of other literary texts. One way to generalize the information about Latin speech represented by this list of passages is simply by applying the traditional method of parallels. In a sense all grammatical study is based upon this method. But we can use the data and the method more efficiently if we try to express the principles implicit in our examples in the form of rules. The following three rules seem to provide the essential classifications.

1. *Distinctio* of some sort occurs at points where what follows does not go closely in grammar with what precedes. *Distinctio,* where it is not called for by the linguistic structure is simply a mistake of speech (see Quint. 11. 3. 39 vitiosa distinctio).

2. *Continuatio* is normal between words when the second goes closely in grammar with what precedes.

Even when a following word does not go closely in grammar with the one that precedes it, *continuatio* rather than *distinctio* occurs under certain circumstances. If one merely compiles a list of the words of this sort in our paradigmatic sentences, it will readily appear that they can be classified under two headings. One classification includes words like "qui" in "Troiae qui primus ab oris" and "vero" in "in coetu vero populi Romani." Conventional terminology suggests the term "postpositives" for words of this class, although the class apparently includes a number of usages not normally described by that term. The postposition involved need not be initial, that is, the postpositive need not stand immediately after the first word or the first fully accented word of a phrase; I believe this class includes all (or almost all) non-initial vocatives without *o*. This class also seems to include words not normally thought of as postpositive at all, e.g., "moenia" in "atque altae moenia Romae," "accusatoris" in "omnem accusatoris orationem," and "dicere" in "tu dicere solebas." This classification also seems broad enough to include attributive modifiers such as "amens" and "insanus" in "incurristi amens in columnas; in alienos insanus insanisti," and nominative or accusative subjects, such as "temeritas" in "patris dictum sapiens temeritas fili comprobavit," and "poenas" in "ab omnibus esse ei poenas persolutas."

Our second classification may be described as consisting of words which serve primarily to complete and fulfill grammatical expectations rather than to arouse them. It includes "ab oris" in "Troiae qui primus ab oris," "Romae" in "atque altae moenia Romae," "partes" in "divisam esse partes," and most verbs in final position.

Our third rule may be stated as follows:

3. Even when a word does not go closely in grammar with the one that precedes it, *continuatio* rather than *distinctio* occurs in the case of (*a*) postpositives and (*b*) words which serve primarily to satisfy and fulfill grammatical expectations rather than to arouse them.

Under the heading of things which possibly modify or affect *continuatio,* there appear to be a number of factors that belong to *pronuntiatio,* e.g., the vocal technique of separating or emphasizing items in a list, the phonetic mark of the predicate and so on.

The first two of these rules or principles will

probably be accepted without much hesitation by any Latinist. Judging by the actual practice of classicists whom I have heard read Latin, I would say that the third principle stated above may seem to involve some novel features. The concept of postposition in Latin is well known, and in fact formed the starting point for Wackernagel's [14] famous study of this linguistic phenomenon in other Indo-European languages. But our principle extends the concept of postpositive and postposition in a number of ways. It defines the position not with reference to the clause or sentence grammatically considered but rather with reference to phrases and phrase boundaries. The influence of this position in Latin speech patterns seems to be much greater than is generally recognized. It accounts, among other things, for the development of postpositive *et* as it is found for example in the elegiac poets. Furthermore, some words because of their grammatical function seem to be treated as postpositives even when they do not stand second in a phrase. Our principle also applies the term postpositive to words which are not normally thought of as postpositives at all in the traditional sense. The precise limits of these applications will have to be explored through further study.

Another novelty may be involved in the concept of words which serve primarily to complete and fulfil grammatical expectations rather than to arouse them. Although practice seems to vary a good deal in how these words are handled orally, I feel that most scholars I have heard read Latin aloud try to indicate grammatical relationships by means of vocal manipulation, especially in cases of complex and involved word order patterns. This seems otiose, since grammatical relation is expressed in Latin primarily by morphological means. Though our examples are few, they seem to be decisive at least in establishing the category of words which I describe in this principle. Here again, however, it may take a good deal more study to determine in actual practice whether specific words in specific contexts actually belong to this category.

As I said at the beginning of this paper, my purpose here is to establish certain principles of utterance as characteristic of Latin speech. The actual application of those principles will require much further study; but I believe that the correlations between speech patterns and word order patterns we have developed will provide us with necessary categories for the analysis of normal literary Latin usage from this point of view.

[14] Wackernagel, Jacob, Ueber ein Gesetz der indogermanischen Wortstellung, *Indogermanische Forschungen* **1**: 333–436, 1892 (reprinted in *Kleine Schriften* **1**: 1–104. Göttingen, Vandenhoeck und Ruprecht, 1953).

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